



ARMSTRONG

LABORATORY

**LOGISTICS COMMAND AND CONTROL  
TRAINING REQUIREMENTS**

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## **PREFACE**

This report describes the Training Requirements Analysis (TRA) performed in support of "Desktop Training for Logistics Command and Control (LC<sup>2</sup>)." This project is being accomplished under Contract No. F33615-91-C-0007, with Systems Engineering Associates (SEA), San Diego, CA. Management of this project is being provided by the Human Resources Directorate, Technical Training Research Division, Instructional Design Branch (AL/HRTC).

# **1. INTRODUCTION**

## **1.1. PROJECT BACKGROUND**

This report describes the first phase of a three-phase project entitled "Desktop Training for Logistics Command and Control." The goal of this project is to build a system to train logistics command and control (LC<sup>2</sup>) personnel in decision making skills. This training system must have two essential characteristics: It must run on a desktop computer and its design must be driven by an explicit instructional theory.

The project continues a series of studies and developmental projects that have been conducted by the Air Force Human Resources Laboratory since 1986. The earlier work in the series achieved the following: (a) identified the need for more cost-effective and more accessible training for command and control personnel (Krebs, Cream, Brecke, Mirman, Parson, Silva, & Thorndyke, 1984; Brecke, Jacobs, & Krebs, 1988; Schwaninger, Malin, & Gumienny, 1991); (b) began to formulate a theoretical framework for training decision making skills (Brecke & Gallini, 1989; Brecke & Young, 1990); and, (c) demonstrated the technical feasibility of providing realistic decision making practice environments on desktop-class computers (Brecke et al., 1989; Brecke & Young 1990).

Starting with the base established by these preceding projects, this project aims to extend and refine the theoretical foundations and apply them to training requirements in the LC<sup>2</sup> arena. The medium will be a desktop-computer-based training system that takes optimal advantage of the continuing advances in microcomputer hardware and software technologies. The instructional strategies embedded in the training system must be theory based and re configurable to permit empirical research to validate and extend the theoretical framework.

## **1.2. PROJECT PHASES**

The general plan for the project (shown in Figure 1) is designed to accomplish the following: (a) firm up the theoretical base, define the training requirements, choose the technology tools (hardware and software) during Phase 1 (Year 1); (b) develop a preliminary prototype during Phase 2 (Year 2); and, (c) develop and evaluate a functional prototype during Phase 3 (Years 3 and 4). Phase 1 thus consisted of three tasks that were performed in parallel, each interacting with and enhancing the other two.

### 1.3. REPORT STRUCTURE

This report is focused on the Phase 1 efforts to define the training requirements (Section 3). For the sake of providing a comprehensive picture of Phase 1 and a context for the training requirements work, the report also includes a synopsis of Phase 1, including brief discussions of the work on the theoretical foundations and the technological aspects (Section 2). The report concludes with a summary for Phase 1 (Section 4). A full and detailed description of the theoretical framework is available in a separate technical report (Brecke & Garcia 1994, in press). The results of the technology tool search and tryouts are represented in actual prototype software and in system requirements and design documents.

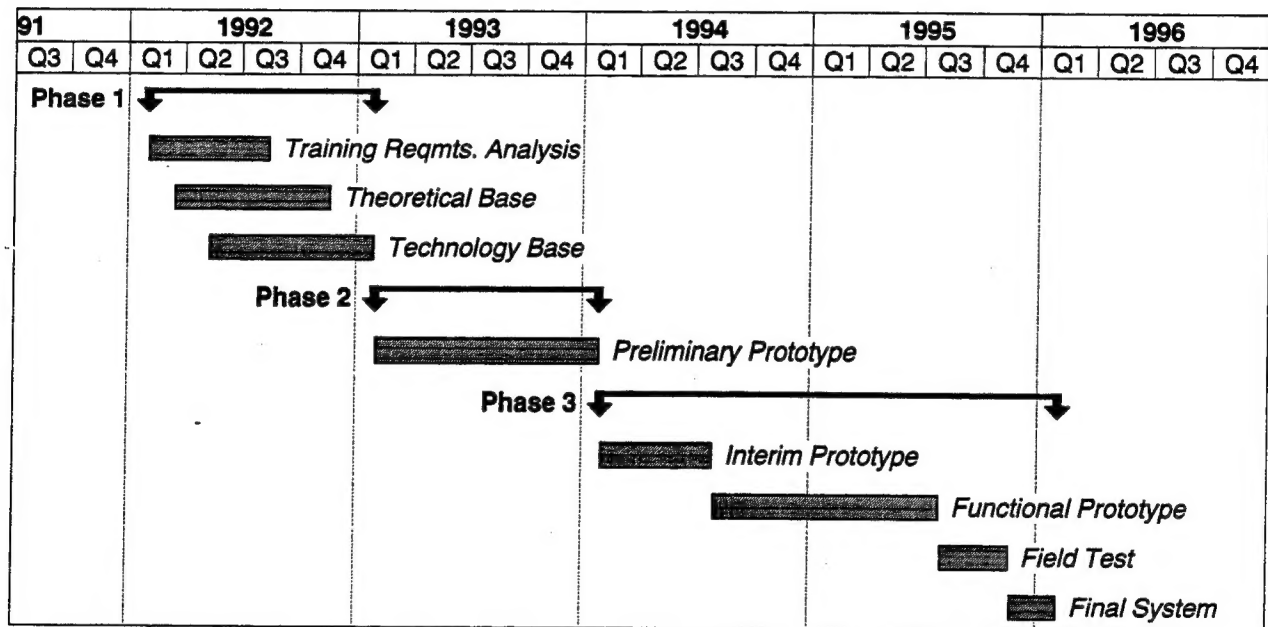


Figure 1: Project Plan



## 2. PHASE 1 SYNOPSIS

### 2.1. OBJECTIVES

Phase 1 had two goals:

1. Research, develop, and document an "integrated presentation and practice C<sup>2</sup> instructional methodology" .
2. Specify and document job performance and training requirements "for selected logistics job positions" .

The development of an instructional methodology requires the development of an organizational strategy, a delivery strategy, and a management strategy (Reigeluth, 1983). Organizational strategies specify which subject matter content should be included, how that content should be partitioned and sequenced, what type of instructional elements should be included, and what form these elements should take. Delivery strategies specify the physical means or media by which the instructional elements are to be conveyed to the learner. Management strategies specify the conditions for when to apply any given organizational elements and/or delivery components.

The three types of strategies interact, and each is driven by different considerations. Organizational strategies are driven by theoretical considerations of learning and instruction and by the requirements of the tasks to be trained. Delivery strategies are determined by the requirements imposed by organizational and management strategies and by the technical capabilities and constraints of instructional media. Management strategies are driven by constraints imposed by both organizational and delivery strategies and by demands arising from theories of instruction and learning. Specifying an instructional methodology thus requires a theoretical base for specifying organizational and management strategies and a technological base for specifying delivery strategies for some clearly articulated training requirement. Since the three aspects of instructional strategy interact, an iterative process of adjusting each to the others is also required.

To achieve its goals, Phase 1 was focused on accomplishing three major tasks:

1. Identify LC<sup>2</sup> positions which have job performance requirements that include decision making tasks and describe the training requirements for these types of tasks.
2. Establish a theoretical base for training the target decision making tasks, and develop appropriate organizational and management strategies.
3. Establish a technology base for defining a delivery strategy that can deliver what the organizational and management strategies require.

## **2.2. THEORETICAL BASE**

The work on the theoretical base for the project used as its foundation, results obtained in previous decision making projects (Krebs, et al., 1984; Brecke, et al., 1988). These projects utilized Merrill's (1983) Performance-Content Matrix classification system to classify the decision making skills required of C<sup>2</sup> personnel. These skills were classified as "Use-Principle skills", which implied that learning of this type of skill depends on prior acquisition of factual, conceptual, and procedural skills. A description of the learning process in the form of a six-stage learning model for the acquisition of decision making skills was developed by synthesizing a number of multistage learning models (Brecke & Gallini, 1989). This model provided relatively coarse and incomplete guidelines for the specification of organizational and management strategies.

Against this background, a new approach to the problem was pursued. Four basic questions were asked in sequence:

- What is decision making?
- How do people perform the decision making task?
- How do people learn decision making?
- What direct instructional design guidance for training decision making skills is available?

Each of these questions were answered by reviewing and synthesizing appropriate sources in the literature, and by expanding and connecting the theoretical and empirical fragments that were found into a cohesive theoretical framework. A number of instructional design guidelines were derived from the answers to each of the questions. These guidelines were then used to

specify a comprehensive, generic organizational strategy and a rudimentary management strategy for training decision making skills.

The first question was answered by interpreting decision making as a cognitive and affective process that rolls off in four sequential phases: Recognition, Uncertainty Reduction, Implementation, and Feedback. The central process of uncertainty reduction seeks to reduce uncertainty about situation, goals, and options down to a level where commitment to a particular option can occur, even though some residual uncertainty remains. The notion of sequential phases was developed into a **Timeline Model**; the uncertainty reduction aspects were captured in an **Uncertainty Model**. From this conceptualization of the decision making task then followed instructional design guidelines or "training heuristics" were developed as follows:

- Training in decision making should include explanations of the general nature of the decision making task and the characteristics of its four phases.
- Practice decision making problems should have the same temporal and uncertainty profiles as the target tasks in the real world.
- Students should be taught to recognize and prioritize uncertainty reduction requirements.

The timeline and uncertainty models provided the basis for a Process Model for Decision Making. The process model covers the entire continuum of performance from the analytical, "rational outcome calculation" (Noble, Grosz, & Boehm-Davis, 1987) of the novice, to the intuitive "recognition primed" (Klein & Calderwood, 1990) decision making of the expert. The process model, together with empirical findings on human "limitations and deficiencies" in decision making (Nickerson & Fehrer, 1975), provided an answer to the second question - "how is it done?".

The third question on learning decision making skills was answered by simplifying the earlier six-stage model into a more parsimonious four-stage model and by combining this model with Merrill's Performance-Content Matrix. This combination was justified by the concept of prerequisite learning, which is an inherent feature of both multistage models and Merrill's matrix. The four stages in learning decision making were called Novice, Advanced, Competent, and Expert. Given this model, the novice has to accomplish three transitions to become an expert. Instructional design guidelines for each of these transitions were deduced. One of these

guidelines is to leave the third transition to learning on the job, whether such learning is supported by some form of On-Job-Training (OJT) or not.

The fourth and final question examined the current state of the art in instructional design. Ideally, instructional design as a technology should provide fairly specific off-the-shelf guidance for solving any particular training problem. Off-the-shelf guidance is actually available for military decision making in the form of an instructional strategy developed by Aagard and Braby (1976). This guidance is published in a military handbook for instructional systems development (ISD), the Interservice Procedures for Instructional Systems Development (NAVEDTRA 106A, 1975). This strategy was judged to be unsuitable as a basis for methodology development for this project primarily because of its unclear theoretical and empirical support. More solidly supported guidance was available from Reigeluth's (1983) Elaboration Strategy, Merrill's (1983) Component Display Theory, and Keller's (1983) Motivational Design of Instruction, as well as from a collection of instructional design guidelines by Montague (1988).

The guidance from these ISD sources was combined with the guidance derived from the answers to the first three questions to develop a comprehensive, generic instructional strategy for training decision making skills. The strategy includes both organizational and management aspects and consists of a macro-level strategy for a decision making course and micro-level strategies for the building blocks of a course, i.e., for lessons and exercises.

The macro strategy first partitions a course of instruction in logistics decision making into a number of levels of elaboration, starting with the epitome level. On each level, the student accomplishes the transitions from Novice to Advanced (Transition #1) and then from Advanced to Competent (Transition #2). Transition #1 is facilitated by a form of "canned" Computer Assisted Instruction (CAI) consisting of a series of lessons. Transition #2 is facilitated by immersing the student in simulation exercises that depict a real LC<sup>2</sup> node engaged in supporting an operational force. In these simulation exercises, the students have to apply what he has learned during Transition #1 to decision making problems presented in the context of dynamically evolving battle scenarios. On Level 1 (the epitome level), the student becomes competent in a very simple decision making environment. The complexity of the decision making environment increases from one level to the next and reaches "operational, real world" complexity in the last level.

Micro-strategies for lessons are based on Merrill's CDT. Micro-strategies for exercises are based on fidelity considerations and on instructional considerations. Fidelity with the

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operational environment requires that the student be exposed to a scenario as if they were "pulling shifts" in an LC<sup>2</sup> center and that the student perform the same types of tasks during a shift as they would in real life. Instructional considerations require that task difficulty be carefully controlled and that some types of feedback be made available that are not found in the real operational environment.

The number and type of instructional components on each level and the conditions for their sequencing will be modifiable so that a wide variety of instructional strategies can be presented and investigated.

### 2.3. TECHNOLOGY BASE

The technology base for the project was established by system design activities that included development of a system architecture, choice of a hardware platform and software tools, development of system requirements and design documents, and extensive prototyping.

The initial system architecture was developed on the basis of specifications included in the contract, ideas developed in the proposal, and intensive discussions between the instructional technologist and the system engineer assigned to the project. The initial architecture went through several metamorphoses over the course of Phase 1, until it stabilized into the form pictured in Figure 2.

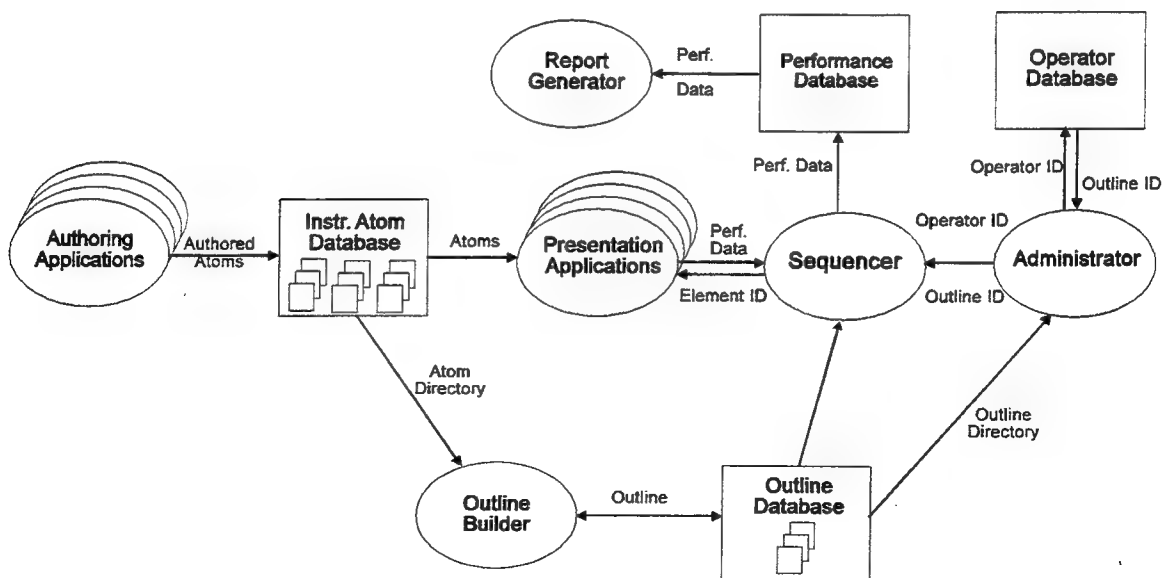


Figure 2: Training System Architecture

Besides the fact that this architecture provides for the required functionality, it has the following salient features:

- It operates on a generic, Windows-based personal computer (PC), such as the machines bought with the Desktop III Program.
- It maximizes the use of commercial off-the-shelf (COTS) software (most Windows applications may be used to author and present instruction).
- It provides for independent authoring of instructional content and instructional strategy.
- It minimizes implementation risks.

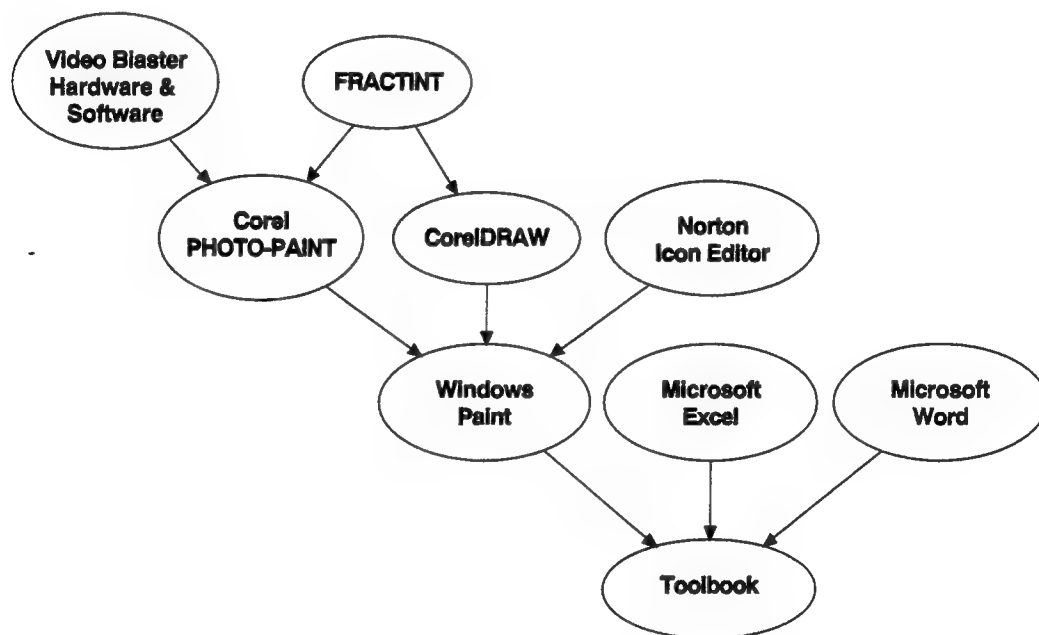
The four databases included in the architecture interact with student, system manager, and research personnel through six processes. The core of the system is the Presentation Applications (a 'process' in system architecture terms) that present instruction either in the form of tutorial CAI or in the form of simulation exercises. The elements of this instruction are drawn from the Instructional Atom Database and sequenced by the Sequencer process in accordance with an outline. The outline is drawn from the Outline Database and applied in response to student performance. Student performance data are acquired by the Presentation Applications, used by the Sequencer, and stored in a Performance Database, from which a Report Generator can produce customizable reports. Authoring of instructional content is accomplished by the Authoring Applications process (which can use any Windows application), whereas authoring of instructional strategy is done by means of the Outline Builder process. Access to the system is controlled by the Administrator process, which interacts with the Operator Database. The Operator Database "knows" all registered users, the parts of the system they have access to, and which student is assigned to which course. It also "remembers" where a user quits, facilitating easy return to the same place.

This architecture was partly determined by an early decision to use Desktop III (PC-compatible) hardware, which will be the standard desktop computer platform in the Air Force. This choice assures that the training system will be widely and easily accessible. The choice also limited the search for software tools to those compatible with this type of hardware.

The details of this architecture were worked out by a fairly formal and conventional software system design process that began with high-level requirements and a high-level

architecture. The design process then progressed to the development of a System Requirements Document (SRD) that in turn formed the basis for a System Design Document (SDD).

Prototyping of sequencer concepts and user interface ideas began while the SRD was still in development. Two prototypes were developed. The first prototype demonstrated that the planned sequencer concept was indeed feasible. It also provided a first cut at user interfaces for tutorial CAI components and for the simulation exercise components. The second prototype focused on the user interface for the simulation exercises and on the particular interactions required for message reception, agenda creation, and the formulation of decision goals and options. The user interface of the second prototype was a significant improvement over the interface used in the first prototype. It was much more closely aligned with the conventions of a Windows-based environment, much more graphically oriented, visually more exciting, and considerably more "intuitive." Both prototypes were entirely generated with a broad range of Windows applications, as illustrated in Figure 3.



**Figure 3:** Application Software used in Prototyping

At the end of Phase 1, both the theoretical base and the technological base for the remainder of the project were firmly established. While these essential foundations were being developed, work on the driving issue, the issue of training requirements, was in progress. This work is described in Section 3.



### **3. TRAINING REQUIREMENTS ANALYSIS**

#### **3.1. APPROACH**

##### **3.1.1. Objectives**

Training Requirements Analyses (TRA) are conducted to determine what needs to be trained and to what level of proficiency. In this project, these general questions were a priori focused on the special needs for training in decision making skills in a population identified as LC<sup>2</sup> battlestaff. The specific objectives for the set of tasks that comprised the TRA track for Phase 1 of this project were as follows:

1. Specify job performance requirements, performance criteria, and training requirements for selected logistics job positions.
2. Document the specification of job performance and training requirements of selected logistics job positions in a technical report.

The first objective changed slightly over the course of Phase 1. "Selected job positions" originally meant a number between 1 and 3 positions. "Specifying job performance and training requirements" meant generating complete task and objective lists for these positions in accordance with guidance provided by AFP 50-58, "Handbook for Designers of Instructional Systems." As further explained in the subsequent sections of this report, during the early stages of the work on the TRA track, the decision was made to change focus from a few select positions to a much broader range of positions and from complete analyses of all job tasks to analysis of a class of decision making tasks common to that entire range of positions. The focus shifted, in other words, from a small to a large population, and from all tasks to a specific task type.

The specific target class of tasks are characterized by the formal features of the decision problem that must be solved during task performance and by a number of task variables. Most of these task variables are routinely used by instructional designers to discriminate tasks that should or should not receive training.

The fundamental problem in this class of decision making task is to decide how to best

satisfy demands for logistical support, given the following:

- A number of alternative sources that could be tapped.
- A number of alternative means to get the resources to where they are needed.
- A more or less constrained window of time.
- More or less complete, reliable, and valid information on the factors that must be considered in making the decision.

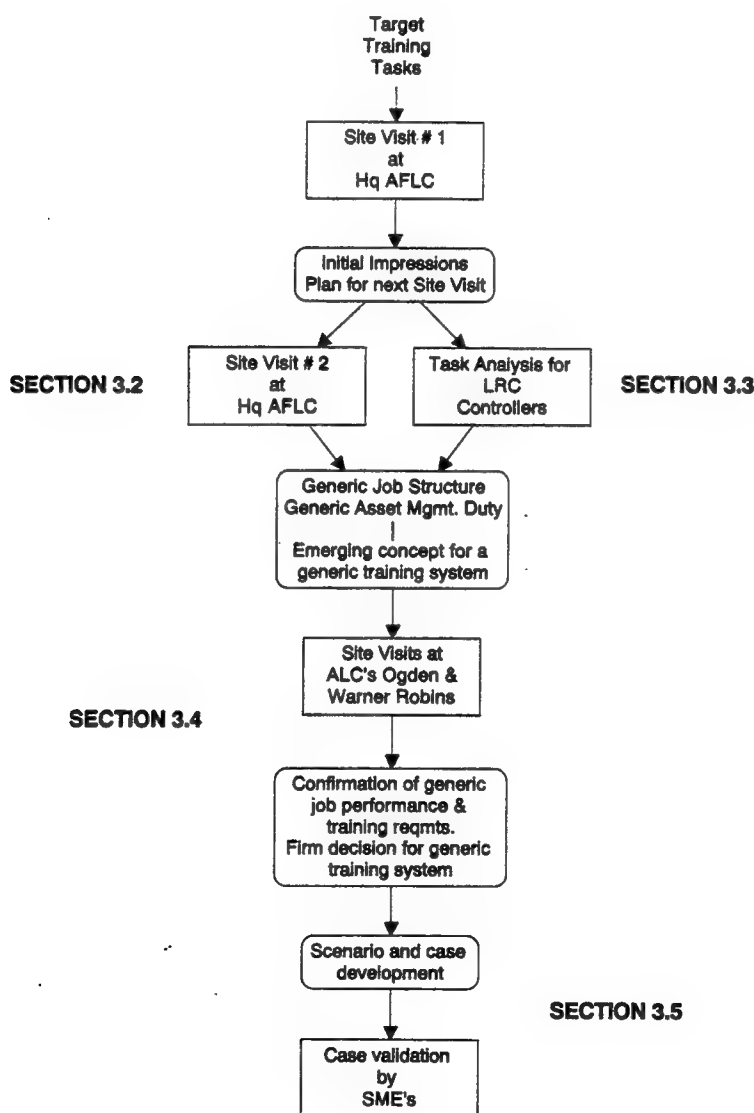
The targeted decision making tasks should satisfy a number of other characteristics that are described as value ranges on a number of variables:

- Frequency: The task must be performed at least several times a day under "normal" wartime conditions (i.e., it is a medium-to-high-frequency, recurring task).
- Difficulty: Specific instances of the task can assume a wide range of difficulty, from a very low level of difficulty where the task is largely "proceduralized" to a very high level of difficulty where "standard" methods of performance do not work and "creative" decisions must be made.
- Importance: The task involves high stakes, i.e., it results in significant losses if it is not performed correctly (it is highly "mission critical").
- Environment: The task is performed in a noisy environment where other tasks compete and/or interfere with the performance of the decision task.
- Constraints: The task must be performed under the constraints of an overall operational plan and of "doctrine."
- Current Training: Under current training conditions, expert levels of task performance are achieved only after several years of job experience.

This class of decision making tasks presents substantial training requirements in quantitative as well as qualitative terms and is therefore a "lucrative target." An improved training capability for this type of task can be expected to have operational payoffs that are well worth the investment.

### 3.1.2. Methods Overview

To accomplish the TRA, job/task interviews were conducted during four site visits; a generic task analysis for positions in Logistics Readiness Centers was developed; a widely occurring generic logistical decision making task was identified, that task was analyzed and described along with a terminal training objective, a concept for an appropriate training environment for this task was developed; and finally, this training environment concept was operationalized with a script for a scenario that included four specific instances of decision making tasks. Figure 4 shows all this in a flowchart of the overall methodology used for the TRA task. The remainder of this section follows this chart as indicated in Figure 4.



**Figure 4:** Methodology for the Training Requirements Analysis (TRA)

### **3.2. SITE VISITS AT HEADQUARTERS AIR FORCE LOGISTICS COMMAND**

The TRA work began with two site visits at Headquarters Air Force Logistics Command (HQ AFLC). The battle staff at HQ AFLC had been selected as the target C<sup>2</sup> agency for this project.

#### **3.2.1. Initial Site Visit to AFLC**

##### **3.2.1.1. Objectives**

The objectives of the first site visit were:

1. To develop a basic understanding of the organization and positions of the battle staff at HQ AFLC.
2. To select a position that has to perform recurring decision making tasks from that battle staff as a first target position for the project.
3. To secure the cooperation and assistance of an expert position holder in the development of the job performance and training requirements.

##### **3.2.1.2. Methods**

The initial site visit was conducted immediately after the kickoff meeting in February 1992. A plan for the site visit was submitted during the kickoff meeting but the "short fuse" did not allow for it to be followed exactly. The AFLC hosts nevertheless managed to arrange a series of 11 meetings over a time span of 3 days. A list of interview topics pursued in most of the meetings is provided in Table 1. Transcripts of the notes taken during the meetings are found in Appendix A.

**Table 1: Interview Topics**

1.	Purpose of the meeting, goals of the contract
2.	Wartime battle staff organization
3.	Peacetime organization
4.	Major functions within battle staff
5.	Basic process for executing these functions
6.	Examples of decision making tasks
7.	War stories

### **3.2.1.3. Initial Impressions**

The first visit resulted in the impression that there was a low probability that battle staff personnel at headquarters AFLC had to perform the type of recurring decision making tasks targeted by this project. The consensus among interviewers and interviewees was that the Munitions and Transportation positions on the battle staff were the most likely positions where recurring decision making tasks might be encountered.

### **3.2.2. Second Site Visit to AFLC**

#### **3.2.2.1. Objectives**

The objectives for the second site visit were:

1. To develop a clear, but not necessarily detailed, picture of the job performance requirements for the Transportation and Munitions battle staff positions.
2. To determine whether recurring decision making tasks were part of the job performance requirements for the Transportation and Munitions battle staff positions.
3. To identify one or more SMEs for each of the two functional areas and to secure their cooperation for the remainder of Phase 1.

### **3.2.2.2. Methods**

The second site visit was conducted approximately one month after the initial site visit, in March 1992. During this visit only personnel from Munitions and from Transportation were interviewed. A prepared set of interview forms were used, which are attached as Appendix B. The individual responses were assembled into two composite responses, one for Munitions and one for Transportation. These two composites are attached as Appendix C.

### **3.2.3. Results**

During the first two site visits insights were gained into the nature of the battle staff at HQ AFLC. It was confirmed that the positions within that battle staff do not have to perform the type of recurring, routine, decision making tasks that were sought. It was realized that the business of LC<sup>2</sup> is partitioned primarily along "functional areas," each of which has its requirements, methods, and knowledge bases; with basic commonalties among all LC<sup>2</sup> jobs, regardless of organization, level in that organization, or functional area. In response to these findings a model of the LC<sup>2</sup> domain was developed, a rationale for using an artificial domain in training formulated, a decision was made to design the training system for the Desktop III hardware platform and a Windows software environment, and plans made to search for the target type of recurring decision making tasks at the level of the Air Logistics Centers (ALCs).

#### **3.2.3.1. Nature of the Battle Staff Organization at HQ AFLC**

The battle staff at HQ AFLC is an ad hoc organization that is currently in transition and that essentially manages "by exception":

Ad Hoc Organization: The battle staff is an organization that is formed in response to crises. It does not exist during normal peacetime conditions, except during exercises. The composition of the battle staff is completely flexible: At any time during a crisis it includes just those positions and/or representatives from functional areas that are deemed necessary by the Battle Staff Director (BSD) to deal with the crisis. There is a small core of positions that will be present in most, if not all crises: the BSD, the Special Action Officer (SAO), the CODAT team and MPRC representatives.

In Transition: AFLC is an organization in transition, and therefore the battle staff is also in transition, where the term "transition" really means that there is imminent change but the nature

of this change is not yet fully determined. Plans, procedures, methods, and organizational composition are currently being revised. Existing documentation is therefore outdated. There are, strictly speaking, no SMEs who are current.

Management by Exception: The battle staff appears to function as a facilitating agency if and when exceptions to the normal, planned functioning of the logistics system occur. As long as the logistics system works as planned, the battle staff at AFLC Headquarters basically monitors logistics operations, keeps an eye on how things are developing, and tries to anticipate and prevent problems. When problems do occur, the battle staff assists in determining causes and in eliminating any roadblocks that may exist.

### **3.2.3.2. Evidence for Recurring Decision Making Tasks**

The interviews during the initial visit did not turn up any convincing evidence that individual positions on the battle staff perform the types of recurring decision making tasks described under Section 2.2. At the end of the first visit, the impression was that the positions that were most likely to perform that type of decision making might be found in the two "functional areas" called Munitions and Transportation. These two areas were therefore targeted for more intensive interviews during the second site visit.

During the second site visit, some indications for recurring decision making tasks in the Transportation area appeared during the first interview, but subsequent interviews in the same area disconfirmed that initial indication. In both areas, Munitions as well as Transportation, each interviewee seemed to view the battle staff job from the perspective of their peacetime specialty, which accounts for some of the lack of commonality between responses that were ostensibly describing the same job. However, in a display of otherwise rare agreement, six of the seven respondents indicated (independently) that there is very little or no decision making involved in their battle staff positions and that the main function performed is one of tracking down and relaying information.

One respondent who was also familiar with the C<sup>2</sup> operations at an Air Support Operations Center (ASOC), indicated that the logistics equivalent to the type of recurring decision making task that occurs at the ASOC is found at the ALC battle staffs and at the Ammunition Control Points (ACP) at ALC Ogden and ALC Warner Robins. Probing into the nature of the tasks found there produced the impression that these decision making tasks are

indeed of the same formal type as the ASOC tasks. The respondent drew the table below for us (Table 2).

**Table 2: Occurrence of Recurring Decision Making Tasks**

Joint Chiefs of Staff			
Air Staff Battle Staff			
Air Force Logistics Command Battle Staff			
Air Logistics Centers			
LOCATION	BATTLE STAFF with an LRC	MUNITIONS CONTROL POINT	TYPE OF MUNITIONS
OGDEN	Yes	Yes	Air/Ground Conv.
ROBINS	Yes	Yes	Air/Air Conv.
SAN ANTONIO	Yes	Yes (?)	Nuclear
OKLAHOMA CITY	Yes	No	Strategic Missiles
SACRAMENTO	Yes	No	

The interchange with this respondent also shed light on a number of remarks heard during the first site visit and on a number of responses from others following this interchange. This information added up in a consistent manner and made it highly probable that the ALC battle staffs were indeed the level of C<sup>2</sup> where further concrete examples of the type of task targeted for this project could be found.

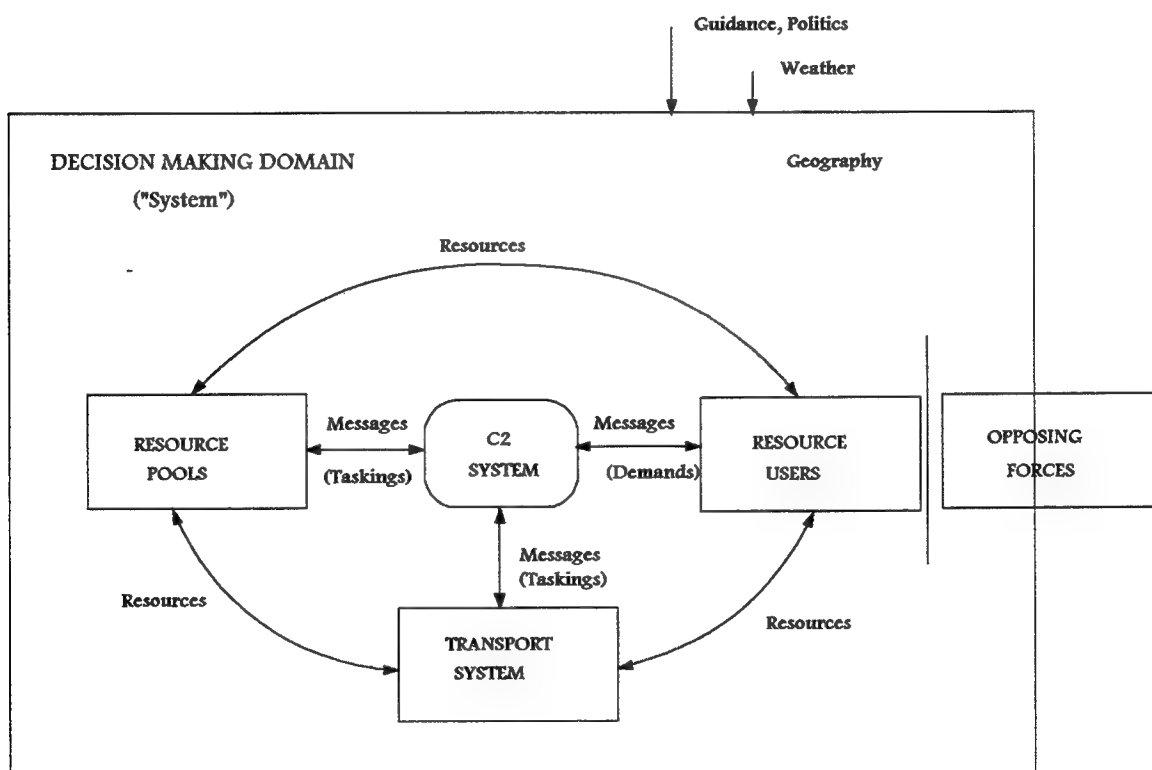


### 3.2.3.3. Training Media

To be effective, training must be easily accessible. Such accessibility is virtually guaranteed if the training system runs on the desktop microcomputer stations that are currently found on nearly every desktop within AFLC. These microcomputer systems are about to be upgraded under the Desktop III procurement, which means that the training system should be designed for Desktop III hardware. It is assumed at this point that the ALCs are also in the process of switching to the newer hardware.

### 3.2.3.4. Generic LC<sup>2</sup> Domain Model

The general structure of the "system" within which LC<sup>2</sup> must be performed is pictured in Figure 5 below.



**Figure 5:** Schematic Representation of the LC<sup>2</sup> Decision Making Domain

The figure shows Resource Users that are combat units (such as divisions, wings, squadrons, etc.), a  $C^2$  System that can be more or less elaborate (such as a single node or multiple nodes), Resource Pools (such as depots, ALCs, wings, etc.), and a Transport System (which can be more or less involved and includes air, sea, and land transport units). Decisions are triggered by request messages coming from resource users into the  $C^2$  system where the decision maker sits. The decisions made by the latter are implemented through messages that task resource pools and the transport system to provide resources. These messages then trigger a flow of resources to the requesting user. The entire system is embedded in an environment subject to a number of uncontrollable factors such as the actions of the opposing forces, politics, weather, geography, and so on.

### **3.2.3.5. The Case for Generic Training System and an Artificial Domain**

The originally planned approach results in a training system that includes a high-fidelity simulation of a specific decision task domain. Application of this training system to other decision tasks performed by the same or other battle staff positions, or by battle staff positions in other units (such as ALCs), or by battle staff positions in other Commands (such as TAC), require modifications of the simulation. Any changes in battle staff doctrine, organization, or procedures also require changes to the simulation.

Modifications to a high-fidelity simulation are inherently labor- and expertise-intensive and therefore costly, no matter how cleverly and adroitly the simulation authoring interface is structured. The specific training requirements of relatively very small populations will therefore require relatively high initial and sustained investments. This represents a significant obstacle to a widespread application of the training technology product of this contract, particularly in today's climate of defense cutbacks.

This obstacle can be avoided entirely if the approach to the contract's objective avoids the requirement for high-fidelity simulations of real decision environments. This can be accomplished by developing a generic decision training system instead of developing a shell for generating many specific decision training systems. A generic decision training system can work with a "simulation" that represents an entirely (and explicitly) artificial world. The basic structure of this artificial world can be identical to the general structure of a military command and control domain. Such an artificial world can present the same types of decision problems while avoiding the specific features (and the constant changes to these features) of the many little specialized domains within military command and control. It would, in other words, be basically a wargame.

A training system incorporating such an artificial world is therefore immediately applicable to the training requirements of a very large and diversified population of command and control job holders and augmentees - and it is completely impervious to any but the most significant changes in C<sup>2</sup> organization and employment.

A generic decision training system will provide a considerably higher return on the investment even if the system cannot satisfy as many of the specific training requirements for an individual position as a specialized training system could satisfy. The position and unit-specific training requirements that a generic decision trainer would not cover involve specific "local" knowledge and specific "local" procedures. These kinds of training requirements can be satisfied with complementary desktop computer training technology that can combine the functions of job aiding and training. The authoring skills required for this type of device are no more taxing than the skills required for the operation of modern spreadsheets or word-processing programs, i.e., they are essentially available in every unit.

A combination of generic decision making training and locally specific job-aiding and knowledge and procedure training is therefore likely to be much more cost-effective than the training system product originally envisioned in the proposal. The concerns of locally specific job-aiding and training will not be addressed by this project, but the concerns of generic training for a class of decision making tasks that occurs frequently in C<sup>2</sup> in general and in Logistics C<sup>2</sup> in particular are the prime focus of this project.

### **3.3. GENERIC TASK HIERARCHY**

The interview methodology used during site visits was one of two avenues followed in developing job performance and training requirements data. The second avenue was analysis of pertinent documentation. In the pursuit of that second trail two particularly interesting and pertinent documents were identified. Both of these documents were so-called "Concepts of Operation" or CONOPS for short. One of them was a rather broad CONOPS for AFLC LC<sup>2</sup> and the other was a more narrowly focused CONOPS for Logistics Readiness Centers or LRCs (Synergy, 1992; Branson, Ford, Hagel, Duke, Siler, & Wood, 1991). The latter was developed by a team of "blue suit" Air Force logistics experts and proved to be especially helpful to our needs: It provided a set of very carefully assembled job descriptions for all the positions generally found in an LRC. This material allowed for further investigation into the notion of commonality among LC<sup>2</sup> jobs and to develop a generic task hierarchy. This part of the TRA work is described below.

### **3.3.1. Objectives**

The objectives for the document analysis work were:

1. To validate the job performance information obtained by interviews during site visits.
2. To supplement the site visit information by capitalizing on existing data.
3. To improve our understanding of Logistics organizations, methods, and language.

### **3.3.2. Methods**

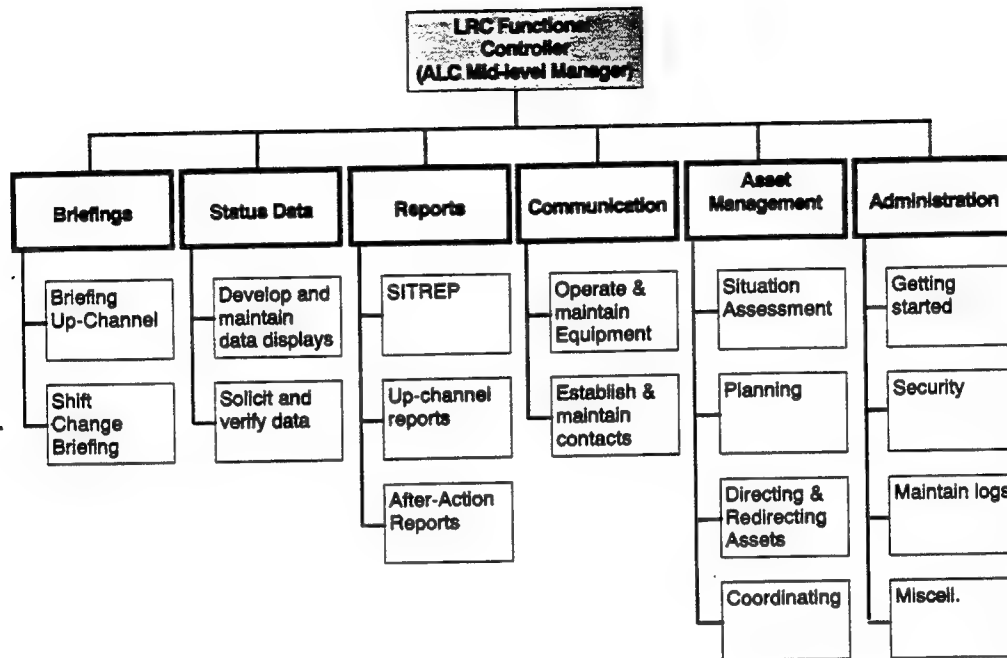
The LRC CONOPS document was written "generic enough to be blind to MAJCOM uniqueness, but specific enough to be useful for planning an LRC at any given level of command." The document was developed by compiling "inputs from various wing/base units, Numbered Air Forces (NAFs), MAJCOMs and Air Staff." It describes in essence a generic LRC from a variety of aspects. The data considered most important were contained in a section called "Organization and General Functions," in individual chapters describing each position, and in an appendix that provided an extensive checklist for each position. The data from these three parts of the CONOPS document were combined to produce composite job performance requirements data for all of the four "functional" LRC controller positions: Aircraft Maintenance, Munitions, Transportation, and Supply. The composites were then analyzed for logical groupings and sub-groupings, i.e., the natural hierarchical order in the composite data was traced and made explicit.

The AFLC LC<sup>2</sup> CONOPS is written in more general terms and encompasses not just LRC functions but all of AFLC C<sup>2</sup>. It addresses the complete set of functional areas by providing mission statements for each as well as descriptions of roles in the C<sup>2</sup> process, chain of command, process flow, and infrastructure. The process flow descriptions include flowcharts. This document enabled the cross-validation of the conclusions from the LRC data and further corroborated the notion of job commonality.

### **3.3.3. Results**

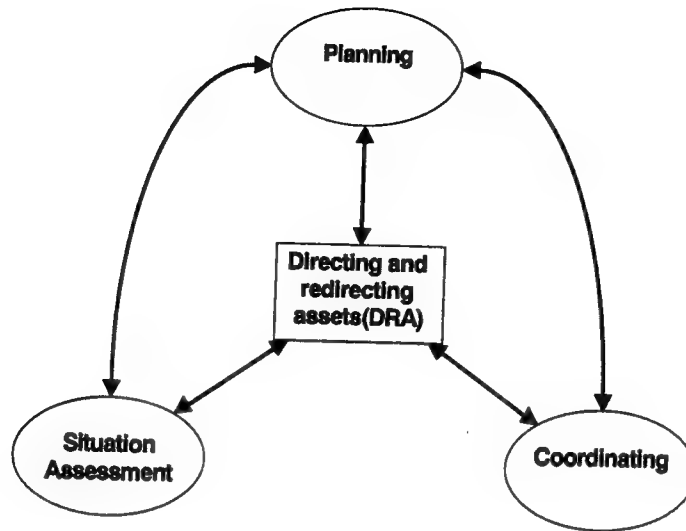
The four functional LRC jobs could be represented with a job task hierarchy that is essentially generic for the first three levels and nearly generic on the fourth level could be represented. Job differences begin to occur only on the task and subtask levels. The target decision making tasks were found in the hierarchy branch under the Asset Management duty. The

first three levels of this hierarchy are shown in Figure 6; complete hierarchies for each of the four positions are found in Appendix D.



**Figure 6:** Generic Task Hierarchy for Multiple Logistics C<sup>2</sup> Positions

The Asset Management duty could be represented by four functions or "super" tasks: Situation Assessment, Planning, Directing and Redirecting of Assets, and Coordination. These tasks are related as shown in Figure 7.



**Figure 7:** Model for the Asset Management Duty Found in Multiple Logistics C<sup>2</sup> Jobs

The central function is Directing and Redirecting of Assets (DRA), and the other three are essentially support functions. DRA is performed in response to logistic taskings, which in turn are responses to operational requirements that may occur in peacetime, during crisis build-up and deployment, during the sustainment phase of a conflict, and after a conflict during redeployment.

DRA can be a routine procedural function or a decision making function. During peacetime, the emphasis is more on strict procedural execution. In crisis and wartime situations, there is usually a heightened urgency of "getting the job done" instead of adhering to procedure and "red tape." This leads to a greater emphasis on decision making and to decision making on lower levels, i.e., to an increase in the number of active decision makers.

DRA can be readily interpreted in the light of the generic Demand and Supply model developed after the first two site visits (see Figure 5). At this point in the TRA task the following had been determined: (a) a generic LC<sup>2</sup> job structure for functional area managers in LRCs; (b) a common asset management duty; (c) four common functions under that duty; and, (d) a compatible generic model of the system or the domain in which that duty must be performed.

These results supported the validity of the concept of a generic training system featuring an artificial domain. Further exploration of the idea was therefore warranted. It was believed that concrete examples of the asset management duty were needed, not only to further understanding

of the duty and its limits of commonality but also to gather subject matter material for scenario generation and prototyping efforts that were proceeding at the same time. Since the first two site visits had pointed to the ALCs as the "best bets" for finding the target decision making tasks, it was decided to visit two of them, ALC Ogden and ALC Warner Robins, next.

### **3.4. SITE VISITS AT AIR FORCE LOGISTICS CENTERS**

#### **3.4.1. Objectives**

The objectives for the site visits to ALCs were:

1. To further corroborate the generic LC<sup>2</sup> job structure and the structure of the Asset Management duty at a lower level of AFLC.
2. To determine whether the target decision making functions/tasks do occur at the ALCs and to gather concrete examples for these tasks.
3. To validate the initial scenario concept.
4. To secure the assistance of appropriate SMEs.

#### **3.4.2. Methods**

Two site visits were conducted, one at ALC Ogden and one at ALC Warner Robins. Preparation for the visits included distribution of a brief, one-page explanation of the purpose of the visits to prospective interviewees (see Appendix E). The visit at ALC Ogden took place in June 1992. Fifteen logistics experts from various organizational levels and functional areas were interviewed during seven interviews. The visit at ALC Warner Robins also occurred in June. Seven interviews were held during which 16 SMEs were interviewed who came from various organizational levels and functional areas. The interviews at both ALCs focused on the first two objectives above and usually took between 60 and 90 minutes. The notes from these interviews are found in Appendix E.

#### **3.4.3. Results**

The most significant result of the interviews was the confirmation that the target decision making tasks are indeed performed at several management levels at the ALCs. The bulk of decision making in LC<sup>2</sup>, both in terms of task frequency and number of performers, is the day-to-

day decision making performed by lower and mid-level logistics management positions with functional areas of responsibility.

The generic job structure and the existence and nature of the Asset Management duty within that job structure was confirmed as well. Logistics personnel, whether they sit in ALCs (in positions with 3, 4, and 5 letter office symbols) or in LRCs, have jobs with very similar duties and tasks, even though the specific knowledges and skills needed for performing these duties and tasks differ by functional area, by MAJCOM, and by specific unit.

The interviews also generated a sufficient number of concrete decision making examples or "cases" in several functional areas. These examples were in all instances compatible with the domain model (see Figure 5) and with the model of the relationships between the functions of the Asset Management duty (see Figure 7). The initial scenario concept was unanimously judged to be "very realistic," free of basic misconceptions, albeit lacking specific detail for some of the functional areas.

These results provided the critical mass of concrete evidence to justify a firm decision to design and develop a generic training system for "Air Force Logistics Asset Management Decision Making." The examples gathered during the interviews and the critiques of the initial scenario enabled the ideas for an artificial training domain to be taken a step further. This next step is described below.

### **3.5. TRAINING SCENARIO DEVELOPMENT**

#### **3.5.1. Objectives**

The objectives for this last part of the TRA work were:

1. To validate and improve the training system and artificial domain concepts.
2. To validate and improve our understanding of the Asset Management decision making tasks.
3. To provide subject matter material for the prototyping efforts.
4. To apply the theoretical base to logistical decision making tasks in the artificial domain.



### **3.5.2. Methods**

A futuristic, space-based scenario which represented a logistics world that was structurally identical to the current Air Force logistics world was developed. The result was essentially a "parallel universe" that explicitly disavows any claim to high fidelity in terms of procedural detail but that, at the same time, is governed by exactly the same underlying principles. This provides a training environment in which the same types of cognitive activities can be exercised as in the real, Earth-bound world of Air Force logistics, while avoiding the cost and the "logistical" burden of developing and maintaining a high-fidelity training environment.

Embedded within this scenario were four "cases" of specific logistics problems (patterned after problems discussed during interviews at the ALCs). These cases were developed in a detailed step-by-step fashion from the initial eliciting stimulus to the implementation of a decision. Each of the cases was first described as a fictional protocol of the decision making process of an expert. This account was then interpreted in light of the decision making models developed in the theoretical work. Finally, student interface requirements were indicated for each step in the process. The scenario and the protocol descriptions of the four cases were then submitted to selected SMEs for review. The scenario was also used to develop a second training system prototype. The scenario materials are attached as Appendix F.

### **3.5.3. Results**

At the time this report was written, one SME had returned the materials with comments. This SME rated the realism of the cases between 5 and 7 on a 10-point scale (10 indicating "exactly like real decision making in the Air Force today.") and provided valuable comments for improving each of the cases and the scenario. As important as SME validation is for the correctness of the eventual training system product, the fact it was possible to apply the theoretical base to concrete cases of logistical decision making is an even more important result. As the tabulated cases in Appendix F show, the fictional protocol accounts of the cases are strictly determined by the logical, rational characteristics of the scenario and the specific situation that elicits the decision making process. The interpretations of each case in terms of the theoretical base show a seamless, natural, and unforced fit of the theoretical concepts to the operational cases.

### **3.6. OVERALL RESULTS**

The overall results of the TRA work can be summarized as follows:

There was good evidence that there is a rather large population of mid-level logistics managers at the ALCs, and a perhaps even larger number of functional controllers manning LRCs in crisis and war situations throughout the rest of the Air Force, that has a set of common, generic job performance requirements differing only on the subtask and step levels. The key duty of the job positions held or manned by this population is Asset Management. The central function in Asset Management is Directing and Redirecting of Assets (DRA).

During peace time, Asset Management in general and DRA in particular are performed in a bureaucratic and procedural fashion that maximizes the application of regulations and minimizes the need for decision making. During wartime, however, the necessities of responding appropriately to an operational conflict demand a quite different *modus operandi*: The issue is no longer adherence to the rules, the issue is to get the job done. The predominance of regulations gives way to practical considerations of accomplishing required support actions. This in turn requires that more people at lower levels must now engage in the risky business of decision making instead of consulting regulations or "elevating" the decisions to superior positions or organizations.

Peacetime practice in solving logistics problems is therefore not a sufficient preparation for wartime situations. Peacetime job performance undoubtedly establishes the required knowledge base and the procedural skills for a given functional area, organization, and specific position. It does not, however, present an environment that is conducive to the acquisition of decision making skills. Training that is specifically aimed at developing such skills is therefore a necessity.

The theoretical work has shown that decision making skill can be thought of as a collection of cognitive methods that is largely invariant across specific domains and which therefore can be applied to a wide range of domains. It is assumed that the wartime decision making skills required of the identified logistics population are invariant across functional and organizational boundaries, even though the knowledge bases on which these skills must operate may differ widely.

The decision making performance required by logistics personnel was captured in a set of models: a model of the Demand and Supply problem in Logistics, a model of the Asset Management duty, and a general process model of decision making. Thus, a detailed, theory-based, and content-free description of the skill to be trained now exists.

Finally, with the futuristic, space-based scenario, it was possible to begin development of a knowledge base that is representative of Air Force logistics. Nevertheless, it is relatively impervious to local organizational and procedural differences and to the constant changes experienced by a military establishment that is more in transition now than ever before.

The TRA work accomplished its objectives: Job performance and training requirements for selected logistics job positions were established and, with this report, documented.

## **4. PHASE I SUMMARY**

Phase 1 of this project defined and described a training requirement and established the theoretical and technological bases for satisfying this requirement. This is exactly what Phase 1 was designed to do. But, while the essential goals for this phase were indeed reached, the project also underwent a metamorphosis that was unforeseen and unplanned. This deviation from the original project's orientation became known as the "Specific to Generic Shift."

The original target for the project was a very specific training system for a specific class of decision making tasks performed by a specific logistics position. The key component of the system was to be a specialized, high-fidelity simulation environment, which would require at least a workstation-class hardware platform. As the work in Phase 1 progressed, and primarily as the TRA part of the work progressed, concepts and ideas began to develop that eventually lead the researchers to revise the original target. The new target is a training system that trains general decision making skills in an artificial logistical context, i.e., a simulation environment with low physical and procedural fidelity that can run on a standard DESKTOP III platform.

This target shift is a shift from a very sophisticated, high-fidelity device for a very small target population to a less complex, lower-fidelity device for a potentially very large population. It is also a shift from an experimental research system that might have eventual field applications, to a system that will have been in the field for more than 2 years before the project ends and that still retains all the research utility of the original target system. The target shift also means that the system can be developed much faster, that earlier and more field trials can be held, that there are virtually no maintenance or update costs when the system is finished, and that the system can be migrated much more easily to other than logistical contexts such as other MAJCOMs or across service boundaries.

In other words, the potential return on the investment is much larger for the new project goal and the development risks are lower. However, there is an increased risk of low transfer of training. This new risk is minimized by the theoretical base, which supports an argument for transfer, and it is minimized by the close structural and functional similarity of the artificial world to the real world, but it is not eliminated.

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## **APPENDICES**

### **APPENDIX A: INTERVIEW TRANSCRIPTS FROM 1ST SITE VISIT**



These transcripts are in the sequence in which the interviews were received. For each interview the notes consist of two parts: the first part is a near verbatim transcription of handwritten notes taken during each interview. The second part is a set of comments and impressions that were written after the interviews, during the transcription of the notes.

**1. February 19, 0800-1000, AFLC Command Center Tour, J. Stivers / XPOC / 72451, Command Center**

Transcription:

- Description of capabilities and features of the command center by John Stivers.
- Newcomb: Could day-to-day and wartime training requirements be addressed by the same instruction?
- Answer (mostly LTC Rogge): No, chain of command is different, more direct; wartime does not include any long-term program management, and the problems that occur are different (e.g., tie-down nets).
- The battle staff is both proactive and reactive.
- Training on terminology, e.g., "acceleration" versus "surge," is a requirement.
- There are many factors driving acceleration.
- Command Center Management Team will be responsible for training system.
- Prioritizing seems to be an important skill (in wartime).
- Newcomb: Command Center would be an ideal environment for "Functional Context Training" (Shoemaker, Humrro).
- Organizational Network knowledge seems to be important.
- Knowledge of communication systems (where is what information) seems to be important.
- "The Logistics World" - Basic Logistics for newcomers (like operational types from TAC).
- There was a problem with the F-15's: Sand was blasting the windscreens: The major job is problem solving, also issuing guidance and policy. The action is at the ALCs.
- LRC, Logistics Readiness Command at Air staff has similar job.
- Briefings being developed will consist of a set of core items and a number of interest items (such as acronym explanations).
- AFLC is a support command and not a CINC that determines the character of battle staff operations.

Comments:

- The Command Center is brand new and equipped with great AV technology. Ideal for team training.
  - Exercises are now occurring very rarely - perhaps once a year. Contingencies - well, one never knows. The room certainly seems to be available.
  - Decision making in the battle staff appears to involve primarily decisions concerned with what to do about a problem and who to give it to.
2. **February 19, 1000-1100, Battle Staff Director, Mr. Delbert A Smith / XPO / 75146, B266, Rm. 5**

Transcription:

- The basic concept is that XPO is responsible for preparing plans for crises and for executing these plans when a crisis does occur.
- You become aware of crises officially through WWMMCS: "our ear to the world," which is run by CODAT and unofficially through CNN.
- Various planners (members of Mr. Smith staff) are assigned to prepare the plans for various geographic areas and to watch for signals of crises: "You learn what to watch for."
- If and when a crisis develops, a response cell is formed and, as the heat increases, at some point the judgment is made to tell the boss (Col. Williams), who then calls in the battle staff based on recommendations of the response cell.
- The first guys to bring in are the Transportation guys and the Manpower guys.
- The people you bring in are the ones who have built the contingency plans. They tailor their plans then to the actual crisis during the execution.
- The first thing to figure out is what weapon systems are moving and when and where; then you alert the ALC that supports that weapons system that some tasking might be coming.
- After that you call in the weapon system guys, the SCOs.
- Then the munitions guys.
- Then the "miscellaneous guys" and the facility and admin guys.
- The BSD makes the call, the judgment, the decisions.
- Then the question of accelerating and/or surging arises and, as soon as that happens, costs start coming into the picture.
- Then the ESC comes on line.
- Contractors may get involved.

- Issues of repair, maintenance, and supply pop up and policies must be distributed. That involves a number of standard, basic methods, which get adapted and modified as the situation requires.
- The whole thing is management by exception: As long as the system functions normally the battle staff at AFLC does not get involved, but as soon as problems come up that cannot be handled on lower levels the battle staff does get involved.
- The battle staff deals with problems and distributes/issues policies.
- You need to know who to go to and you need to have a very good mental model of a complex system, the logistics system.
- Training should focus on the Battle Staff Director and/or the Special Action Officer, the BSD and/or the SAO.

Comments:

- Mr. Smith gave us a rather very illuminating account on what happens during start-up. We did not get into what occurs during the crisis and as the crisis winds down.
- 3. February 19, 1330-1500, BS Training: Environment and Security, Dan Denham / XPOW / 74925, Command Center**

Transcription:

- This was a validation session for some "training materials" that had been developed by the Command Center Management Team.
- Materials consisted of bullet slides (in color) on the topics of the facility layout (do clean up in the kitchens after you're done!) and security.
- They are in the process of developing a 20-block / 8-10 hour training package on the basics of battle staff operation. (Mr. Denham told us the next day that 19 of the 20 were already done at least in draft form. See Nr. 6 below.)

Comments:

- The materials were inadequate. No professional training developers were involved in their creation and that really showed.
- 4. February 19, 1500-1600, Plan 8, "Butch" Kittle / XPOC / 75550, B266, Rm 220**

### Transcription:

- We had received Plan 8 the day before and were basically familiar with it. My concern was to focus in on a "quintessentially logistical" area asap. We asked Mr. Kittle to identify those. His response was:
- Transportation: SMEs are Mr. Pequignot, Jerry Riffe, Captain. Heatherton.
- Munitions: SMEs are Sam Giardina, Bill Powell.
- Propulsion: Ray Olfky.

### Comments:

- The pros and cons of focusing on each of these functional areas were discussed and transportation was identified as perhaps the best target because it is a functional area that is also found in the battle staffs for each of the ALCs. This means more SMEs, more subjects for trials, more bang for the training buck.
5. **February 20, 0900-1000, Special Actions Officer, Maj. Vicki Dever / XPOC /75550, B266, Rm 220**

### Transcription:

- The SAO is essentially an "exec" to the BSD.
- Going into Desert Shield, there was really no training: The exercise schedule was curtailed.
- The basic plans and procedures were there, and they evolved during the operation.
- Personally had lots of C<sup>2</sup> experience (since 1982).
- Does not think that exercises are really beneficial, partly because they lack realism.
- Believes that battle staff personnel need a system on the computer at their desktops that provides basically job aiding functions.
- Content of such a system should essentially be what she is trying to put together in a position handbook.
- Believes that keeping things updated would be hard but necessary and worthwhile. Update process should be easy and reliable.
- Does not think there is a lot of decision making going on because of the nature of the command.

Comments:

- Maj. Dever is the no-nonsense, practical, operational type. An unusually perceptive and pragmatic officer.
- She voiced something that had already been mentioned by others either in the interviews or in other conversations we had: The need for a computer-based job aid embedded in their desktop stations at the command center and perhaps also at their peacetime normal workstations.
- Also very interesting was her assessment on the value of exercises, which is shared by many officers I have talked to during this trip and during all previous studies we have done starting with COMPAC in 1986.

**6. February 20, 1030-1130, CODAT, Dan Denham / XPOW / 74925, B266, Rm 220**

Transcription:

- Head of a 5-member team from XPO developing core briefing/training materials for battle staff, completion by May 15 or so.
- Out of 20 modules or blocks, two are "done" at least in draft form. Three or four other modules ("interest items") will also be developed. All this stuff will go into a guidebook. The slides we saw for the first two modules will also be accompanied by the text of the presentations, i.e., the narrative will be included in the guidebook.
- The whole shebang will be given as an 8-10 hour course.
- CODAT manages deployment of Command resources, and one key element in that function is the WWMMCS system.
- CODAT also maintains a watch on operational data coming through on the WWMMCS and extract information that is relevant to AFLC.
- Feels that all in all they were well prepared, although "some of the people you trained weren't the ones that showed up."
- There were a few holes.
- Next exercise JCS in spring next year.
- No AFLC internal exercises.
- There is a course taught at Maxwell AU: Contingency War Planning. 3 weeks long; Col. Stanton is course director. Thinks that this course should be a requirement for battle staff personnel.
- Wants to have the course he is developing put on the desktop computers.

Comments:

- Functions of CODAT did not become much clearer during interview. Further study required.
- Interesting that he and Maj. Dever have the same idea for a computer-based training plus job aid thing and that they are both pursuing about the same content.

**7. February 20, 1330-1430, MPRC, Bev Howdieshell / 77391, B266, Rm 220**

Transcription:

- MPRC is made up of people from DP (Personnel), XPM (Manpower), CK (Reserve Affairs).
- Can be activated by Air staff even before the battle staff is activated.
- Did not think they were well prepared (for Desert Shield/Storm).
- There were not enough augmentees and they were not all trained.
- Especially noticeable shortfall in people qualified to act as team chiefs.
- DEFCON changes: Some people just did not know what to do.
- Need to have a quick reference book or some computer reference facility. Information is currently distributed over too many books.
- In a crisis you never have enough people trained.
- Had problems in communication and problems with tasking authority.
- Reservists are only activated in wartime, so there were some problems with that.
- Great war stories: The father and the molester of a child were both in theater in the same unit. Had daddy airlifted out of there before he'd find out and do away with the other guy in the fog of war.
- Other story: Commander of a reserve unit jumps the gun and ships his people without running them through a proper checkout line and there they were on an airplane to Tinker and from there to Kuwait. They were intercepted in Tinker and properly outfitted.
- Not really a logistics area, basically a personnel area.

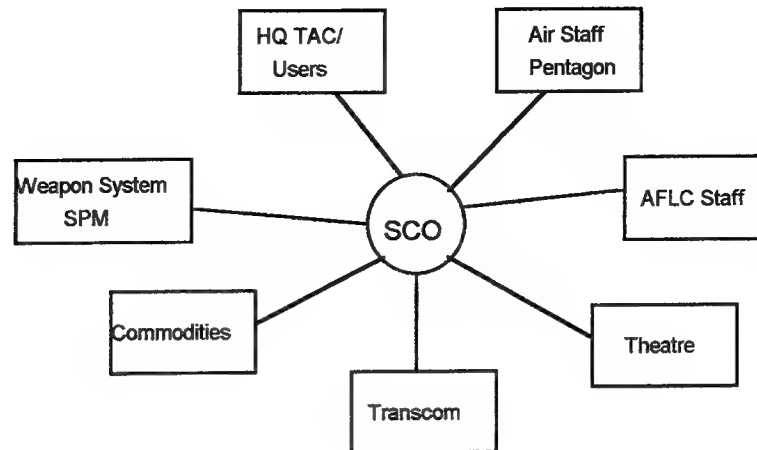
Comments:

- Although the area has a lot of great "human interest" stuff, it is simply not very "logistical." Not suited for our purposes.

**8. February 21, 0800-0900, Weapon Systems (SCO's), Bob Rhea / XRT / 78281, B266, Rm 220**

Transcription:

- Everyday job: Division Chief for the Tactical SCOs.
- Normal organization consists of three Force Structure Directorates: Tactical (XRT), Strategic (XRN), and Airlift (XRB), plus the Commodities Directorate (XRC) and the Propulsion and Munitions directorates. (Normal Org of what pray tell?)
- There is a SCO-ship for all major weapon systems and these SCO-ships consist of a Lead SCO plus two assistants.
- F 16 SCO: F16, F4, F106
- F 15 SCO: F15, E3
- F111 SCO: F111, F22
- A10 SCO: A10, A7, Drones
- Training SCO: T37, T38, JPATS, T1
- Role of SCOs: Link between System Program Managers (SPMs) at ALCs and headquarters AFLC, Commander and Air Staff, advocate for SPM and weapon systems, basically "liaison" between SPM and everybody else, "information brokers"; SCO is HQ representative for SPM.
- Basic means of interaction: SITREP.
- System works on an exception basis. Example: early on during the "unpleasantness" in the Persian Gulf the damaged parts weren't coming back. Depots had nothing to repair. They had to find out why (No airlift capability? No time to pack and ship? Sent to USAFE?) and get the flow started or unstopped. Similar problem as the infamous pallet problem. (Shippers stateside were running out of pallets because they weren't coming back from theater.)
- Function of SCO is to be a troubleshooter.
- Basic process is to monitor the incoming stream of information/messages for problems that are associated with one of the deployed weapon systems, assess that information, decide what to do about it, and send out messages designed to alleviate an existing or forestall an impending problem.



Comments:

- The SCO area is attractive because of the possibility of limiting the initial domain to just one weapon system such as, for example, the F16 or the A10. There also seem to be sufficient SME numbers.

**9. February 21, 0900-1000, Munitions, William Powell / LGWP / 74800, B266, Rm 220**

Transcription:

- Appeared with three military personnel plus one other civilian in tow.
- LGW peacetime organization consists of 34 people. Two divisions: Systems and Programs and Plans and Policy. The 34 are split about evenly between these two divisions and the civ/mil mix is about 50/50.
- During crises they have a nine person team which supplies about one or two people to the battle staff per shift.
- They deal with STAMPs and STRAPs, which stand for "Standard Transportable Air Munitions Package" and "Standard Tanks, Racks, Adapters and Pylons Package."
- They basically go by the TPFDD, which is a plan made up for a particular theater before a crisis happens. The Southwest Asia TPFDD was apparently not a good fit to the actual crisis that did occur and therefore was extensively modified in the first few days. After about two weeks everything settled down and then went pretty smoothly.
- They manage by exception. If the TPFDD is real good they don't do much. If problems come up they take over and make it happen.



- Basic process: Monitor incoming message traffic for requirements (munitions status, EARFLAP, SITREPs), detect problem, decide what to do about it, send out messages designed to correct problem or forestall problem.
- Described fundamentally different mode of operation in wartime as compared with peacetime: In peacetime there is strict adherence to a cumbersome and slow bureaucratic system in which people seem to avoid decision making at all costs. That goes completely out the window in wartime. "People actually made decisions and good ones" and "they actually asked you whether they could do anything for you."
- Also: In peacetime, personnel in munitions are specialized to particular munitions, in wartime they need to be conversant with all munitions since there is only one or two guys on the battle staff.
- They manned their battle staff slots with very, very experienced personnel: The least experienced had 14 years in the field. Average was about 20 years of experience.
- They judged exercises as a waste, "definitely not realistic"; no formal battle staff training was given; they were peeved that their area was usually given short shrift in exercises.
- They deal with about 10 to 15 agencies outside of the battle staff.
- They deal with 106 munitions end items and 44 tanks, racks, etc.
- All are shipped disassembled.
- Many have subcategories.
- There is an automated system that supports their efforts: CAS = Combat Ammunition System.

#### Comments:

- This is a "quintessentially" logistical area.
- Very attractive because the basic problem types are simple and because they can be replicated from one type of munitions to other types.
- Also, we could limit ourselves very neatly at first to one kind of munitions and then add on other kinds as we go.

**10. February 21, 1000-1100, Transportation, G. Pequignot / LGTX / 76703, B266, Rm 220**

Transcription:

- Peacetime positions: 153; Battle Staff positions: 2.
- Peacetime and wartime is not much different: Peacetime depends on dollars, wartime depends on an allocation of lift in tons/day (which is fundamentally different!).
- Functions: Look at workload at air terminals and at the resources to accomplish it and take any necessary measures to get the resources if they are short.
- Control problem: make sure that what needs to go by air goes by air and what needs to go by surface goes by surface.
- Interesting organization: LogAir and Shipper's Service Control Office are part of it in peace and war.
- Interact with ALC bases, with MAC, TRANSCOM, Military Traffic Management Command (part of TRANSCOM).
- Have 10-16 SMEs.
- Do their business in accordance with regulations governing the Military Transportation System (Military Standard Transportation and Movement Procedures, DoD Reg.) and AFRs.

Comments:

- Interesting and complex area, somewhat a world unto itself.
- The other areas need to interact with it: If it moves, it has to come to Transportation: i.e., we might have to model this no matter what.

## **APPENDIX B: INTERVIEW FORMS FOR 2ND SITE VISIT**

## Interview Form for 2nd Site Visit

Interview No.: \_\_\_\_\_

Name: \_\_\_\_\_

Rank: \_\_\_\_\_

Phone: \_\_\_\_\_

Office symbol: \_\_\_\_\_

Interview date: \_\_\_\_\_

Start time: \_\_\_\_\_

Finish time: \_\_\_\_\_

Interviewer: \_\_\_\_\_

Assistant: \_\_\_\_\_

**Job:**

Peacetime: \_\_\_\_\_

Reporting to: \_\_\_\_\_

Crisis/contingencies: \_\_\_\_\_

Reporting to: \_\_\_\_\_

Basic goal of  
contingency job: \_\_\_\_\_

## **Experience:**

Desert Storm/Shield:                      yes                      no

If yes, in job identified above: yes                      no

If not in this job, then which: \_\_\_\_\_

Exercises: \_\_\_\_\_

Years in current peacetime job: \_\_\_\_\_

Years in same Logistics area: \_\_\_\_\_

Years in Logistics: \_\_\_\_\_

## **Training for Contingency job:**

Formal training: \_\_\_\_\_

\_\_\_\_\_

Informal training: \_\_\_\_\_

\_\_\_\_\_

Subjective assessment of training effectiveness:

Formal:                    1        2        3        4        5 (Best)

Informal:                1        2        3        4        5

How long did it take during Desert Storm for you to become comfortable?

\_\_\_\_\_

How long does it take during exercises? \_\_\_\_\_

## Computer and Communication Systems

What computer and communication systems do you work with during contingencies and during peacetime?

System Name	Acronym	Peace	Cont.
-------------	---------	-------	-------

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Interactions:

Who you interact with ? Internally? Externally?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## Functions:

What are your major functions during contingencies/crises?

1. \_\_\_\_\_ %Time: \_\_\_\_
2. \_\_\_\_\_ %Time: \_\_\_\_
3. \_\_\_\_\_ %Time: \_\_\_\_
4. \_\_\_\_\_ %Time: \_\_\_\_
5. \_\_\_\_\_ %Time: \_\_\_\_

## Decision Making:

Which of the functions above requires you to make decisions on a regular basis?

1                      2                      3                      4                      5                      None

More detailed questions for each circled function on separate sheets.

**Decision Making Detail:**      Function Nr. \_\_\_\_

What must be decided?

What should the decisions achieve?

What factors have to be considered?

Where do you get information on each factor?

What is the greatest problem in making these decisions?

How frequently do you make such decisions?

What is at stake? What are the risks in a faulty decision?

Who else participates in making the decisions?



## **APPENDIX C: COMPOSITE RESPONSES FROM 2ND SITE VISIT**

## Data Gathered During the Second Site Visit from 4 Respondents from the Functional Area of Munitions

### 1. Interviews

Date	Time	Topic Area	Subject Matter Expert	Office Symbol	Phone number	Location
3/26/92	1230 - 1400	Battle Staff Munitions Representative	LTC Robert De Luca	LGW	(513)257 -3031	B266 Rm 220
3/26/92	1400 - 1430	Battle Staff Munitions Representative	GM13 Tom Jackson	LGWS	787480	B266 Rm 220
3/27/92	0740 - 0900	Battle Staff Munitions Representative	GS12 Sam Giardina	LGWS	(513)257 -8286	B266 Rm 220

## 2. Jobs, Experience and Training

Item	Resp.1	Resp.2	Resp.3
<b>JOB</b>			
Peacetime	Munitions Director (LGM)	Joint Munitions Manager	TRAP Manager
Wartime (Battle Staff)	Munitions Rep. Assistant BSD	Munitions Rep.	Munitions Rep.
<b>EXPERIENCE</b>			
Desert Storm	yes	yes	yes
Time to get "comfortable"	0	0	1 week
Exercises	no	annual last 6 Ys	2 CPX's
Time to get "comfortable"	n/a	3-4 hr's	Exerc. not realistic!
Years in current peacetime job	2	7	1
Years in Transportation	22	7	26
Years in Logistics	25	7	26 (A/C Arm.)
<b>TRAINING (for Battle Staff job)</b>			
Formal training	no	no	no
Effectiveness of formal trng.	n/a	n/a	n/a
Informal training	prior C <sup>2</sup> positions	OJT	no
Effectiveness of informal trng.	5	3	n/a

## 3. Computer & Communication Systems Used in Battle Staff Job

Item	Resp.1	Resp.2	Resp.3
WWMCCS (AMMO-1 Teleconf. Progr.)	*	*	*
Data Base on Zenith ("home cooked")	*	*	
Word processor			*
Spreadsheet			*

## 4. Agencies (internal and external) to Interact with in Battle staff Job

Item	Resp.1	Resp.2	Resp.3
<b>INTERNAL INTERACTIONS</b>			
BSD	*	*	*
Transportation reps (Priority 1)	*	*	*
Aircraft SCOs (for A/C beddown)	*	*	
Plans	*	*	
<b>EXTERNAL INTERACTIONS</b>			
Air staff	*	*	
CENTAF rear	*	*	*
Ammunition control points	*	*	*
Contingency mobility package operations	*	*	*
CENTAF forward	*	*	*
Army (Leticanny, PA)	*	*	

MTMC	*	*	
MAC, Scott AFB (for C141's)	*	*	

## 5. Munitions Representative on the AFLC Battle Staff: The Goal of the Job and the Functions Performed by it

### Goal:

Respondent 1: Answering technical questions; offer solutions to problems.

Respondent 2: Concurs with above.

Respondent 3: Provide interface between CENTAF Rear and Warner Robins.

### Functions and Percent of Time spent on Each:

Function	Resp.1	Resp.2	Resp.3
Manage information on munitions stockpiles	80%	70%	
Personnel management	10%	10%	
Planning including briefings	10%	10%	
Fund raising		10%	
Post EARFLAPs			15%
Monitor and task STAMP units			15%
React to problems			40%
Prepare briefings			15%
Maintain events log			15%

### Details for some of the Functions:

The following is a near verbatim transcription of notes taken during the interviews:

#### Manage Information on Ammunition Stockpiles:

#### Respondent 1:

- Information concerning missiles, conventional Air-to-Ground munitions, aircraft associated explosives.
- Must be managed within AFLC, Air Force wide, and in liaison with Army and Navy and Allies (contingency allocations).
- There is a world-wide data management system called DO-6.

- There are two reporting systems whose data must be reconciled: EARFLAP (Emergency Action Reporting for Logistics Program, where EARFLAP 1 reports on ammunition items and EARFLAP 2 reports on non-ammunition items). The other system is the Battle Staff Reporting System, which produces Log SITREPs.
- Example: EARFLAP says that Base A has 100 retards against a requirement of 100. SITREP says that the requirement has been changed to 100 conical fins and that 0 are on-hand. CENTAF Forward will look for the required assets in theater first. If none can be found, they will send a message to AFLC. AFLC will respond by searching for the needed stuff in the depots and by finding some shipping capability.
- Example: Requirements may be for M117/750-lb bombs one day and for Mk. 82's the next day.

#### Personnel Management Function:

Respondent 2:

- Explosive Ordnance Disposal teams must be deployed. They are working with a "zone" concept.

#### Dealing with Industry:

Respondent 2:

- R&D activities
- CEM: combined effects munitions
- Bunker buster

#### **War Stories:**

##### The STAMP Configuration Problem

STAMP packages were originally configured for C-141's. Later on the Civil Reserve Air Fleet came into the picture. Most of their airplanes have to be loaded through side doors. The C-141 configured STAMP packages did not fit through these side doors and had to be reconfigured.

## Data Gathered During the Second Site Visit from 4 Respondents from the Functional Area of Transportation

### 1. Interviews

Date	Time	Topic Area	Subject Matter Expert	Office Symbol	Phone number	Location
3/26/92	0730 - 0900	Battle Staff Transportation Representative	Captain. Jim Heatherton	LGTX	76703	B266 Rm 220
3/26/92	0930 - 1100	Battle Staff Transportation Representative	GS12 Jerry Hatmaker	LGTT	(513)257-3422	B266 Rm 220
3/26/92	1500 - 1600	Battle Staff Transportation Representative	GS12 Robert Tate	LGTV	(513)257-7549	B266 Rm 220
3/27/92	0930 - 1100	Battle Staff Transportation Representative	GS12 Jerry Riffe	LGTX	(513)257-6703	B266 Rm 220

### 2. Jobs, Experience and Training

Item	Resp.1	Resp.2	Resp.3	Resp.4
<b>JOB</b>				
Peacetime	Transp. Planner	Traffic Mgmt. /FMS	Vehicle Mgmt.	Transp. Planner
Wartime (Battle Staff)	Transp. Rep.	Transp. Rep.	Transp. Rep.	Transp. Rep.
<b>EXPERIENCE</b>				
Desert Storm	yes	yes	yes	yes
Time to get "comfortable"	1 month	0	never	0
Exercises	no	no	no	10
Time to get "comfortable"	n/a	n/a	n/a	0
Years in current peacetime job	1	7	3	12
Years in Transportation	10	30	22	15
Years in Logistics	10	30	22	18
<b>TRAINING (for Battle Staff job)</b>				
Formal training	no	JOPS III course, TPFDD Prep.	no	no
Effectiveness of formal trng.	n/a	5	n/a	n/a
Informal training	OJT	Prior Pos.	OJT	OJT
Effectiveness of informal trng.	3	5	2.5	4

### 3. Computer & Communication Systems Used in Battle Staff Job

Item	Resp.1	Resp.2	Resp.3	Resp.4
AFLIF	*	*	*	*
BSMS (E-mail Network)	*			*
Harvard Graphics for briefing slide prep.	*			
Telephone		*		
ETADS			*	no
WWMCCS				*

### 4. Agencies (internal and external) to Interact with in Battle Staff Job

Item	Resp.1	Resp.2	Resp.3	Resp.4
<b>INTERNAL INTERACTIONS</b>				
All other divisions within LGT	*			
Battle Staff Director	*		*	*
Munitions	*	*	*	*
Pallets and nets	*			
Representatives from other funct. areas	*			*
CODAT	*			
MPRC		*		
LGS (supply)		*		
LogAir			*	
XRC (vehicle command levies)			*	
<b>EXTERNAL INTERACTIONS</b>				
US TRANSCOM	*	*	*	
CENTAF rear	*		*	*
MAC	*	*	*	*
21st and 22nd Air Force	*			
Military Traffic Mgmt. Command (MTMC)	*			
Transporters at MAC, TAC, SAC	*			
Transporters at ALCs	*	*	*	
2750th Air Base Wing	*			
CENTCOM LG staff		*		
JCS J-4		*		
LogAir Control		*		
Coalition forces representatives		*		
Commercial freight forwarders		*		
People managing transportation funding				*

**5. Transportation Representative on the AFLC Battle Staff: The Goal of the Job and the Functions Performed by it**

**Goal:**

Respondent 1: Coordinate transportation matters for AFLC.

Respondent 2: Deploy forces as identified in contingency plan.

Respondent 3: Ensure smooth operation of transportation.

Respondent 4: Interface between Base transportation activities (air terminals) and Mac and TRANSCOM.

**Functions and Percent of Time spent on Each:**

Function	Resp.1	Resp.2	Resp.3	Resp.4
Tracing shipments	30%	20%	25%	25%
React to transportation requirements coming into the battle staff, identifying airlift capability, smoothing scheduling problems	50%	80%	50%	50%
React to information requests from Battle Staff Director	10%		10%	
Preparation of briefings	5%		5%	15%
Gathering data for future statistical needs	5%		10%	10%

**Details for some of the Functions:**

The following is a near-verbatim transcription of notes taken during the interviews:

Tracing Shipments:

**Respondent 1:**

- Starts with incoming message from someone like CENTAF Forward, where AFLC is one of several addressees. Message is usually asking something along this line: "What's happening with the stuff we ordered?"
- The Transportation Rep. then needs to make sure that "the stuff" is not stuck somewhere in the transportation system.
- This can usually be accomplished by means of the AFLIF system (which was put together during Desert Storm). Based on the TCN, the Transportation Control



Number, AFLIF can provide a complete history of a shipment starting with the original order. Theoretically, the item is wherever the last entry indicates.

- If the shipment is stuck in the transportation system, one has to find out why it is stuck and then one has to start making decisions on how to get things unstuck and whether to move something ahead in the queue or simply wait till it gets done. The preferred option is to get things unstuck.
- Inquiries for additional lift capacity are made with LogAir.
- Moving something ahead in the queue depends on what cargo is ahead, who owns it, and judging who needs things most. In some cases these issues are elevated, i.e., decided by BSD or higher-level operational commands.

Respondent 2:

- Starts with phone call from other Battle Staffs: They are looking for some cargo with a particular TCN.
- Tracing is best accomplished with the ETADS in the Shipping Control Center because the AFLIF is only good for about 50 DODAADs (Department of Defense Activity Address Directory).
- You can find out where the shipment was last from the system and you then simply relay that information to the requester who asked for it.

Respondent 3:

- A unit or organization requests the status of a shipment.
- You query the AFLIF using the TCN.
- Once you have identified the location of the system, you relay the information to whoever asked for it.
- Interfere with the shipment's scheduled path only when necessary.

Respondent 4:

- CENTCOM or CENTAF users send messages looking for shipments.
- You look up the location in the AFLIF.
- When you find it you answer the message.

#### Identifying Airlift Capacity

**Respondent 2:**

- There may be a scheduled airlift mission but no aircraft has shown up. In such a case, an ALC will ask whether an airplane will be coming, what kind, and when.
- The Transp. Rep. at the AFLC Battle Staff will then contact MAC controllers to determine whether mission is available and whether it is still the same tasking.
- The information received from MAC is then passed on to the requester.
- Basically functions as an information conduit.
- Also frequently adjusts the schedule because assets to be picked up turn out to be located at another base.

**Smoothing Scheduling Problems**

**Respondent 4:**

- Too often airplanes at Air Terminals just dropped out of the sky.
- Apparently JOPES did not work because FLOGEN feeds it and FLOGEN did not work.
- FLOGEN schedules aircraft against movement requirements.
- There is a MAC Scheduling Cell at Scott AFB (Do they make decisions? I should think so, especially when FLOGEN doesn't work! Recurring type decision problem!!)

**War Stories:**

**The Pallet Shortage**

The SITREPs began to indicate that the ALCs were running low in pallets on hand. Things got down to where only 1.5 days worth of supply was left. For a while, pallets were redirected from have's to have not's, which was a good interim solution. Eventually the problem got elevated to the highest level and - apparently - did get solved there.

**The Bunker Buster**

A large conventional bomb that did not easily fit on an airplane. The problem was solved with the aid of the Office of Transportability (WPAFB, Area B).

## **APPENDIX D: TASK HIERARCHIES FOR FOUR LRC CONTROLLER POSITIONS**

## TRANSPORTATION CONTROLLER

### Duties and Tasks

# Transportation Controller

## Duties and Tasks

(Source: CONOPS)

The Transportation Controller should have a working knowledge of all aspects of the transportation function: traffic management, vehicle operations, vehicle maintenance, and airlift, or access to specialists in these areas to assist in accomplishing specific tasks.

Depending upon the unit's organizational structure, many of the transportation functions normally performed in an LRC may be assumed by a transportation control center, transportation control unit, or other organization designed to support the unit's unique requirements. If such organizations exist within the unit's infrastructure, the Transportation Controller should ensure that the duties and responsibilities outlined below are delegated before LRC activation.

## BRIEFINGS

### *Briefing Up Channel*

Ensure you are prepared to brief the Director and Senior Controller on transportation issues within AOR.

Assist the Senior Controller and Director with assembling and delivering the Logistics Situation Briefing to the Commander and his/her BS/CAT.

Provide briefing inputs/material to the LRC Director as required.

### *Shift Change Briefing*

Ensure you receive a complete change-over briefing to include LIMFACS/Shortfalls, open action items, and any other known events that may pose a significant impact during your tour of duty. Review the Significant Events Log maintained at your position to ensure you are aware of actions taken or in progress.

Brief succeeding shift personnel on current situation and the status of transportation activities to enable a smooth and effective transition to the next shift. This briefing should as a minimum include the following subjects:

- Current DEFCON
- Review of status board
- Review of suspenses
- Special projects
- Significant events
- Control center problems/concerns
- Required reports
- Any additional information required to assure the continuity of operations

## **STATUS DATA**

### ***Develop and maintain status data***

Maintain the status boards of all significant events and special interest items.

Monitor status of vehicle assets within the assigned AOR.

Monitor TPFDD flow and sequencing.

Monitor TPFDD movements within the AOR.

Monitor status of materiel handling equipment (MHE) and other key special purpose vehicles.

Track the status of critical vehicles, such as MHE and other vehicles that support sortie generation.

### ***Solicit and verify status data***

Monitor transportation data received from subordinate units, higher headquarters, and other transportation agencies to ensure the data is current and consistent.

Monitor transportation data received from subordinate units to ensure data are updated as required during contingency operations.

Monitor and update required information on vehicle/airlift support, surface, and sea movements received from transportation operating agencies (MAC, MTMC, and MSC).

## REPORTS

### *Sitrep*

Assist the Senior Controller in developing the Commander's SITREP.

Prepare and provide the transportation input to the Senior Controller for inclusion into the Commander's SITREP. The input should address any significant transportation-related events that may adversely impact operations, such as the status of critical vehicles, critical personnel shortages, or serious port backlogs.

Provide pertinent data to the appropriate function for inclusion in the Commander's SITREP and any other applicable status reports.

### *Up-Channel Reports*

Report the status of critical vehicles, such as MHE and other vehicles that support sortie generation.

Assemble data and submit up-channel transportation reports.

Ensure transportation reports required by AFR 55-55 and higher headquarters directives are submitted in a timely manner. Ensure reports are completed in sufficient time to meet "AS OF" and transmittal times.

Prepare information for submission of reports required by higher headquarters. Reports may vary from command to command, as will the particular information requested in those reports. Local commanders may request additional information to be reported for their use, so governing directives must be reviewed to determine what must be reported, to whom it is reported, and when the report must be submitted.

### *After Action Reports*

Complete an after-action report once the LRC is deactivated. Areas covered should include a discussion of any problems that hindered operations, effective work-arounds that were implemented, and observations and recommendations for improvement of LRC operations.

Ensure an After Action Report is submitted to the Logistics Plans Controller reflecting any significant problems or events encountered during your shift.

## COMMUNICATIONS

### *Equipment*

Perform a communications equipment check.

### *Contacts*

Establish communications contact with each of the key transportation agencies within the AOR.

Act as point of contact with other transportation agencies to include representatives of Military Airlift Command (MAC), Military Sealift Command (MSC), and Military Traffic Management Command (MTMC). Other transportation agencies that may interface with the transportation controller are the Common User Land Transportation Manager, host nations, and Intratheater Airlift Manager.

Maintain liaison with higher headquarters, subordinate units, and other functional activities to ensure adequate and timely response to support requirements.

Establish and maintain telephone contact with key transportation agencies as appropriate.

## ASSET MANAGEMENT

### *Situation Assessment*

Monitor status of vehicle assets within the assigned AOR.

Monitor TPFDD movements within the AOR.

Monitor status of materiel handling equipment (MHE) and other key special purpose vehicles.

Provide transportation assessments, when required, based upon current situation and plan execution.

### *Planning*

Be familiar with the transportation requirements of applicable OPlans so necessary preparations, capability determinations and priority allocations can be made.



Monitor status reports and incoming message traffic to determine what vehicle allocations may be required to sustain operations within the AOR.

Ensure transportation actions are consistent with current policies, priorities, and authorizations.

#### *Direction and Redirection of Assets*

Employ available transportation resources to provide the most effective use of those resources to support the mission.

Arrange for land, sea, and air movement of both personnel and equipment.

Manage the use of and/or coordinate Common User Land Transport (CULT), special assignment airlift mission (SAAM) requests, Water Port Liaison Office (WAPLO), and other movement needs.

Prioritize movements consistent with requirements and resources available.

Resolve movement priority conflicts.

Effect redistribution of critical vehicles, such as MHE and other vehicles that support sortie generation, when deemed appropriate.

Redirect MHE and special-purpose vehicle assets to meet prioritized need.

Monitor and help resolve vehicle-related problems.

Respond to requests for replacement vehicles by issuing redistribution orders or passing the request to higher headquarters for backfill.

Manage WRM joint-use vehicle recall and issue actions.

#### *Coordination*

Be responsible to the Director for coordinating transportation requests and allocations.

If enough transportation resources are not available and priorities cannot be resolved, inform the Senior Controller and other appropriate individuals and submit request for assistance to higher headquarters.

Keep the Director and Senior Controller advised of any potential problems pertaining to transportation that

may require Battle Staff or command involvement. Ensure every effort has been made to resolve problems at your level before elevating it to a higher command level.

Inform the Director, Senior Controller, and other concerned individuals of TPFDD occurrences that may have an adverse impact on operations.

Keep the Logistics Plans Controller and the Senior Controller appraised of TPFDD movements.

Assist the Senior Controller with resolution of any LRC LIMFACs or Shortfalls identified by other LRC controllers.

Notify the Senior Controller of any known or anticipated LIMFACS or Shortfalls.

Keep the Logistics Plans Controller appraised of WRM joint-use vehicle status.

Provide transportation assistance to other functional areas in the LRC. Assessment of transportation feasibility for unit moves, available transportation resources, and estimated closure times are examples of questions that may be posed to the transportation controller.

Receive and disseminate information and taskings to the mobility Transportation Control Unit (TCU).

## ADMINISTRATION

### *Getting Started*

Sign in for duty and ensure Senior Controller knows of your arrival

Review and familiarize yourself with the following:

- Incoming message distribution files.
- Outgoing message distribution files.
- Applicable reports and briefings due during your shift.
- LRC team member composition (who's who in the LRC).
- Applicable OPlan annexes, checklists, and procedures.
- Emergency classified material destruction/disposition instructions.

Establish duty stations and individual workshifts within the transportation cell. Ensure that the necessary LRC checklists, operating instructions, and supporting plans required to perform the assigned duties are available.

Assemble data/materials to support the LRC operation. It may be necessary to acquire additional material (i.e., OPlans, CONPlans, checklists, WWMCCS, or other ADP products, etc.) as the contingency or emergency continues.

### *Security*

Ensure you are familiar with the current duress word(s). Obtain duress word(s) from the Senior Controller or Logistics Plans Controller.

Ensure all classified/sensitive materials are properly controlled, protected, secured, and disposed of IAW AFR 205-1. Adhere to COMSEC/OPSEC requirements.

Accomplish required actions for changes in DEFCON status.

### *Maintain Logs*

Maintain a Significant Events Log to ensure continuity from shift to shift. The log should contain any significant events that impact, or have the potential of impacting, the successful conduct of transportation activities within the AOR.

Maintain a Significant Events Log. Ensure taskings are answered/completed. Track completion status via the Significant Event Controller Input Worksheet.

Remain familiar with the status of action items assigned to transportation, and ensure appropriate and timely action is being taken. Obtain OCR coordination on actions that affect more than one directorate or unit.

### *Miscellaneous*

Review incoming messages/inputs and take action as required.

Draft outgoing messages pertaining to transportation.

# Munitions Controller

## Duties and Tasks

(Source: CONOPS)

The Munitions Controller is usually a senior munitions maintenance officer fully knowledgeable of the functions of munitions maintenance. The Munitions Controller is the liaison between the LRC and the Director of Maintenance (MA or DCM) for munitions related issues. As such, he/she should be empowered to act with the full authority of the MA or DCM to accomplish the desired LRC mission. Where it is impractical for the Munitions Controller to be a separate LRC entity, the Maintenance Controller would perform the functions of the Munitions Controller.

These positions are normally filled by the senior Munitions Officers. They are subordinate to the Director and the DCM or MA for implementing policies outlined in AFM 66-1.

## BRIEFINGS

### *Briefing up channel*

Assist the Senior Controller and Director with assembling and delivering the Logistics Situation Briefing to the Commander and his/her BS/CAT.

Ensure you are prepared to brief the Director and Senior Controller on munitions status when required.

Keep the Munitions Controller slides (if standardized or pre-formatted) update for short notice briefings. Provide briefing inputs as directed by the Senior Controller or Director. Ensure hard copies are made/kept of all briefing slides for review by your relief.

Prepare to brief significant events, problems, and decisions to the Director and Senior Controller.

### *Shift change briefing*

Brief significant matters to your replacement during shift change.

Ensure you receive a complete change-over briefing to include LIMFACs/Shortfalls, open action items, and any

other known events that may pose a significant impact during your tour of duty.

The outgoing Munitions Controller should brief his/her replacement before actual shift change-over. All pertinent information necessary to facilitate a smooth transition of responsibilities should be exchanged between the individuals. Particular attention must be paid to open action items, potential or current LIMFACs/Shortfalls, and other concerns that may pose a significant impact on the oncoming controller.

## STATUS DATA

### *Develop and maintain status data*

Maintain the status board/chart of possessed munitions.

Maintains status of Explosive Ordnance Disposal (EOD) Teams when functionally aligned.

Ensure the status of EOD teams is available.

### *Solicit and verify status data*

Assemble data/materials required to support the LRC operation. It may be necessary to acquire additional material (i.e., OPlans, CONPlans, checklists, WWMCCS, or other ADP products, etc.) as the contingency or emergency continues.

## REPORTS

### *Sitrep*

Assist the Senior Controller in developing the Commander's SITREP.

Provide information to the Senior Controller for the Commander's SITREP. Assist the Senior Controller and Director with development and transmittal of the Commander's SITREP. Some HHQs may require a copy of the logistics portions be forwarded to the NAF or MAJCOM.

Provide pertinent data to the Senior Controller for inclusion in the Commander's SITREP.

### *Up-channel reports*

Ensure all reports required by AFR 55-55 or MAJCOM regulations are completed and transmitted NLT the time specified for "AS OF" and transmittal. Prepare any data, reports, or briefing materials that may be required. Ensure data for reports and briefings are kept current.

Ensure munitions maintenance reports required by higher headquarters directives are submitted in sufficient time to meet prescribed "AS OF" and transmittal times.

Obtain personnel recall strength data and provide it to the Administrative Controller for inclusion in his/her report(s).

### *After action reports*

Ensure an after-action report is submitted to the Logistics Plans Controller reflecting any significant problems or events encountered during your shift.

Prepare an after-action report at the end of each shift. The after-action report should include topics to be considered after termination of LRC operations (i.e., changes/additions/deletions to this CONOPs, checklists, OPlans/CONPlans, status boards, etc.). Ensure the after-action report is passed to the Logistics Plans Controller.

## **COMMUNICATIONS**

### *Equipment*

If not already accomplished, initiate a communications equipment check. Ensure nonworking equipment is reported to the Senior Controller or Logistics Plans Controller.

### *Contacts*

Before activation of the LRC, the Munitions Controller should develop pre-scripted message traffic, reports, status boards, etc., to allow for a quick and easy assumption of responsibilities at activation.

Develop and maintain list of important phone numbers and POCs.

Maintain a list of important phone numbers and POCs.

## ASSET MANAGEMENT

### *Situation assessment*

Monitor status and availability of possessed aircraft and munitions.

Monitor status of not-mission-capable (NMC), partially-mission-capable (PMC), and mission-capable (MC) rates.

Monitor status and availability of weapons load crews within the AOR when functionally aligned.

Monitor weapons load crew status.

Monitor MMHE status.

Monitor MMHE prioritization requirements.

### *Planning*

Be familiar with the munitions maintenance requirements of applicable OPlans so that necessary preparations, capability determinations, and priority allocations can be made.

Be ready to provide prioritization load crew assignments within the AOR.

Be prepared to direct/redirect MMHE assets to meet priority taskings within the AOR.

### *Direction and redirection of assets*

Maintain status of all munitions within the AOR and direct movement to meet operational requirements.

Arrange for the resupply/redistribution of munitions assets and munitions materiel handling equipment (MMHE).

Arrange for resupply/redistribution of munitions assets.

Direct aircraft/munitions dispersal if required.

Direct priority of Aircraft Battle Damage Repair (ABDR) team assignments when conflicts arise.

Monitor/manage AGE prioritization requirements.

Resolve maintenance/munitions availability and Air Tasking Order (ATO) conflicts.

Where applicable, manage release of U.S. Titled munitions assets to allies.

### ***Coordination***

Coordinate Theater Ammunition Control Point (TACP) requests.

Coordinate with Security Police for munitions movements.

Coordinate with the Transportation Controller for MICAP or 999 asset movement/resupply.

Be responsible for coordinating all actions concerning munitions maintenance.

Keep the Director and Commander appraised of aircraft and munitions availabilities or Shortfalls/LIMFACs.

Keep the Director and Senior Controller advised of munitions availability or Shortfalls/LIMFACs.

Keep the Director and Senior Controller appraised of munitions maintenance problem areas that may require battle staff or command involvement.

Notify the Senior Controller of any known or anticipated LIMFACs or Shortfalls. Assist Senior Controller with resolution of any LRC LIMFACs or Shortfalls identified by other LRC Controllers.

Ensure the Senior Controller is kept advised of the status of suspended items via the Significant Event Controller Input Worksheet. Advise the Senior Controller when an action item is closed out.

## **ADMINISTRATION**

### ***Getting started***

Report for duty at least 30 min prior to scheduled shift change.

Review and familiarize yourself with the following:

- Incoming message distribution files.
- Outgoing message distribution files.
- Applicable reports and briefings due during your shift.
- LRC team member composition (who's who in the LRC).



- Applicable OPlan annexes, checklists, and procedures.
- Emergency classified material destruction/disposition instructions.

Review the Significant Events Log maintained at your position to ensure you are aware of actions taken or in progress.

Sign in for duty and ensure the Senior Controller knows of your arrival.

Support the LRC operation on a continuous basis until relieved or instructed otherwise by the Senior Controller.

### *Security*

Ensure classified material is properly controlled and protected.

Ensure you are familiar with current duress word(s). Obtain duress word(s) from the Senior Controller or Logistics Plans Controller.

### *Maintain logs*

Keep the Significant Events Log current at all times.

Maintain a file of incoming and outgoing messages.

Maintain a Significant Events Log. Ensure taskings are answered/completed. Track completion status via the Significant Event Controller Input Worksheet.

Maintain an events log of all actions, decisions, and status changes during the shift.

### *Miscellaneous*

Ensure munitions actions are consistent with current policies, priorities, and authorizations.

Be familiar with missile/maintenance computer applications, (i.e., TMRS).

Be familiar with munitions maintenance automated management information systems (i.e., CAS, MDC, MMICS, etc.).

# Aircraft Maintenance Controller

## Duties and Tasks

(Source: CONOPS)

The Aircraft Maintenance Controller is usually a senior aircraft maintenance officer fully knowledgeable of the functions of aircraft maintenance. The Maintenance Controller is the liaison between the LRC and the Director of Maintenance (MA or DCM). As such, he/she should be empowered to act with full authority of the MA or DCM to accomplish the desired LRC mission. Where it is impractical for the Munitions Controller to be a separate LRC entity, the Maintenance Controller would perform the functions of the Munitions Controller.

## BRIEFINGS

### *Briefing up channel*

Assist the Senior Controller and Director with assembling and delivering the Logistics Situation Briefing to the Commander and his/her BS/CAT.

Ensure you are prepared to brief the Director and Senior Controller on maintenance status when required.

Keep the Maintenance Controller slides (if standardized or pre-formatted) updated for short notice briefings. Provide briefing inputs as directed by the Senior Controller or Director. Ensure hard copies are made/kept of all briefing slides for review by your relief.

### *Shift change briefing*

Brief significant matters to your replacement during shift change.

Ensure you receive a complete change-over briefing to include LIMFACs/Shortfalls, open action items, and any other known events that may pose a significant impact during your tour of duty.

## STATUS DATA

### *Develop and maintain status data*

Ensure the Maintenance status board/chart of possessed aircraft has been established and is kept current.

Maintain status of all munitions within AOR.

Maintain the status of EOD teams available for taskings in the AOR when functionally aligned.

Maintain status of Explosive Ordnance Disposal (EOD) Teams when functionally aligned.

#### *Solicit and verify status data*

Assemble data/materials required to support the LRC operation. It may be necessary to acquire additional material (i.e., OPlans, CONPlans, checklists, WWMCCS or other ADP products, etc.) as the contingency or emergency continues.

### **REPORTS**

#### *Sitrep*

Assist the Senior Controller in developing the Commander's SITREP.

Provide information to the Senior Controller for the Commander's SITREP. Assist the Senior Controller and Director with development and transmittal of the Commander's SITREP. Some HHQs may require a copy of the logistics portions be forwarded to the NAF or MAJCOM.

Provide pertinent data to the Senior Controller for inclusion in the Commander's SITREP.

#### *Up-channel reports*

Ensure all reports required by AFR 55-55 or MAJCOM regulations are completed and transitted NLT the time specified or "AS OF" and transmittal. Prepare any data, reports, or briefing materials that may be required. Ensure data for reports and briefings are kept current.

#### *After action reports*

Ensure an after-action report is submitted to the Logistics Plans Controller reflecting any significant problems or events encountered during your shift.

## COMMUNICATIONS

### *Equipment*

If not already accomplished, initiate a communications equipment check. Ensure non-working equipment is reported to the Senior Controller or Logistics Plans Controller.

### *Contacts*

Before activation of the LRC, the Maintenance Controller should develop pre-scripted message traffic, reports, status boards, etc., to allow for a quick and easy assumption of responsibilities at activation.

Maintain a list of important phone numbers and POCs.

## ASSET MANAGEMENT

### *Situation assessment*

Monitor status of not-mission-capable (NMC), partially-mission-capable (PMC), and mission-capable (MC) rates.

Monitor status and availability of possessed aircraft and munitions.

Ensure the status of AGE is monitored.

### *Planning*

Be familiar with the aircraft maintenance requirements of applicable OPlans/CONPlans so that necessary preparations, capability determinations, and priority allocations can be made.

Be prepared to arrange for shipment/transport of AGE assets needing movement to meet a priority need.

### *Direction and Redirection of assets*

Arrange for the resupply/redistribution of munitions assets and munitions materiel handling equipment (MMHE).

Direct priority of Aircraft Battle Damage Repair (ABDR) team assignments when conflicts arise.

Direct aircraft/munitions dispersal if required.

Direct movement of munitions within AOR to meet operational requirements.

Resolve maintenance/munitions availability and Air Tasking Order (ATO) conflicts.

Monitor/manage AGE prioritization requirements.

Where applicable, manage release of U.S. Titled munitions assets to allies.

### *Coordination*

Coordinate all actions concerning aircraft maintenance.

Coordinate Theater Ammunition Control Point (TACP) requests.

Coordinate with the Transportation Controller for MICAP or 999 asset movement/resupply.

Keep the Director and Commander apprised of aircraft and munitions availabilities or Shortfalls/LIMFACs.

Notify the Senior Controller of any known or anticipated LIMFACs or Shortfalls. Assist Senior Controller with resolution of any LRC LIMFACs or Shortfalls identified by other LRC Controllers.

## **ADMINISTRATION**

### *Getting started*

Report for duty at least 30 min prior to scheduled shift change.

Review and familiarize yourself with the following:

- Incoming message distribution files.
- Outgoing message distribution files.
- Applicable reports and briefings due during your shift.
- LRC team member composition (who's who in the LRC).
- Applicable OPlan annexes, checklists, and procedures.

- Emergency classified material destruction/disposition instructions.

Review the Significant Events Log maintained at your position to ensure you are aware of actions taken or in-progress.

Sign in for duty and ensure the Senior Controller knows of your arrival.

Support the LRC operation on a continuous basis until relieved or instructed otherwise by the Senior Controller.

### *Security*

Ensure classified material is properly controlled and protected.

Ensure you are familiar with current duress word(s). Obtain duress word(s) from the Senior Controller or Logistics Plans Controller.

### *Maintain logs*

Maintain a Significant Events Log. Ensure taskings are answered/completed. Track completion status via the Significant Event Controller Input Worksheet.

Maintain an incoming and outgoing message file.

### *Miscellaneous*

Ensure aircraft actions are consistent with current policies, priorities, and authorizations.

Be familiar with aircraft maintenance automated management information systems (i.e., CAMS, MDC, MMICS, REMIS, CEMS, SBSS, COMPES, PAMS, etc.).

Be familiar with aircraft maintenance computer applications (i.e., ASM, CEMS IV, DETS, FR/FI, ATOMS, SIRS, GSU, etc.).

# Supply Controller

## Duties and Tasks

(Source: CONOPS)

The Supply Controller is usually a senior supply officer or senior NCO fully qualified in supply operations and procedures. The Supply Controller is the liaison between the LRC and the Chief of Supply complex.

## BRIEFINGS

### *Briefing up channel*

Assist the Senior Controller and Director with assembling and delivering the Logistics Situation Briefing to the Commander and his/her BS/CAT.

Keep the Supply status slides (if standardized or pre-formatted) updated for short notice briefings.

Provide briefing inputs as directed by the Senior Controller or Director. Ensure hard copies are made/kept of all briefing slides for review by your relief.

Prepare to brief all significant problems, events, and actions to the Director and Senior Controller.

### *Shift change briefing*

Before shift change, the outgoing Supply Controller should brief his/her replacement. All information necessary to provide a smooth transition and continuity of actions should be covered. Particular attention should be paid to open suspended items and LIMFACS/Shortfalls.

Ensure you receive a complete change-over briefing to include LIMFACS/Shortfalls, open action items, and any other known events that may pose a significant impact during your tour of duty.

Provide a complete briefing to your replacement at shift change.

## STATUS DATA

### *Develop and maintain status data*

Ensure a Supply status board has been established and is maintained to track refuelers, WRSK/BLSS fill rates, MICAP actions, 999 assets, etc., within the AOR.

### *Solicit and verify status data*

Assemble data/materials required to support the LRC operation. It may be necessary to acquire additional material (i.e., OPlans, CONPlans, checklists, WWMCCS, or other ADP products, etc.) as the contingency or emergency continues.

## REPORTS

### *Sitrep*

Assist the Senior Controller in developing the Commander's SITREP.

Provide input to the Senior Controller for the Commander's SITREP. Assist the Senior Controller and Director with development and transmittal of the SITREP. Some HHQs may require a copy of the logistics portions to be forwarded to the NAF or MAJCOM.

Provide pertinent data to the Senior Controller for inclusion in the Commander's SITREP.

### *Up-channel reports*

Coordinate with Supply and Fuels Control Centers to ensure all supply and fuels reports required by higher headquarters are submitted in enough time to meet specified "AS OF" times.

Ensure all reports required by AFR 55-55 or MAJCOM regulations are completed and transmitted NLT the times specified for "AS OF" and transmittal.

Ensure REPOL reporting is accomplished IAW AFR 55-55 as supplemented.

Obtain personnel recall strength data from Supply and Fuels Control Centers and provide to Administrative Controller for inclusion in applicable reports.



Prepare data, reports, and briefings that may be required. Ensure data for reports and briefings are kept current.

Provide timely reporting of supply LIMFACS/Shortfalls.

#### *After action reports*

Ensure an after-action report is submitted to the Logistics Plans Controller reflecting any significant problems or events encountered during your shift.

Prepare an after-action report at the end of each shift. The after-action report should include topics for consideration after termination of operations (lessons learned). Ensure the after-action report is passed to the Logistics Plans Controller for consolidation and input to the Director.

### **COMMUNICATIONS**

#### *Equipment*

If not already accomplished, initiate a communications equipment check. Ensure nonworking equipment is reported to the Senior Controller or the Logistics Plans Controller.

#### *Contacts*

Act as consolidated standard base supply system (SBSS) point of contact for his/her AOR.

Before activation of the LRC, the Supply Controller should coordinate with the Supply Control Center as well as the Fuels Control Center to develop preformatted message traffic, reports, status boards, etc.

Develop and maintain a list of important telephone numbers and points of contact.

Maintain a list of important telephone numbers and POCs.

### **ASSET MANAGEMENT**

#### *Situation assessment*

Monitor POL balances, consumption rates.

Monitor SBSS reports and procedures.

Monitor status and availability of refueler vehicles (R-5, R-9, and R-11), equipment, facilities, and fuel levels.

Monitor status of not-mission-capable supply (NMCS) and partial-mission-capable supply (PMCS) aircraft.

Track WRSK/BLSS fill rates. Keep the Senior Controller and Director appraised of WRSK/BLSS fills.

Where applicable, monitor distribution of AFK assets.

### ***Planning***

Anticipate movements of WRM assets or other materiel to meet OPlan taskings.

### ***Direction and Redirection of assets***

Direct POL resupply actions.

Resolve supply/resupply priority conflicts.

Assist in resolving war consumables distribution objective (WCDO) supply, movement, and resupply issues.

### ***Coordination***

- Coordinate LRC actions with the Supply Control Center and Fuels Operations Center.

Coordinate with Supply and Fuels Control Centers to disperse critical assets as deemed necessary.

Coordinate with the Transportation Controller for movement of MICAP or other critical supply assets.

Keep the Director appraised of all supply/resupply actions that may produce a LIMFAC or Shortfall of critical assets.

Keep the Senior Controller advised of supply operations problem areas that may require the Director or commander's involvement.

Notify Senior Controller of any known or anticipated LIMFACS/Shortfalls. Assist in Senior Controller with resolution of any LIMFACS/Shortfalls identified by other LRC Controllers.

## ADMINISTRATION

### *Getting started*

Report for duty at least 30 min prior to scheduled shift change.

Sign in and ensure Senior Controller knows of your arrival.

Support the LRC on a continuous basis until relieved or otherwise instructed by the Senior Controller.

Review and familiarize yourself with the following: incoming/outgoing message distribution files; applicable reports and briefings due during your shift; LRC team member composition (who's who in the LRC); applicable OPlan annexes, checklists, and procedures; emergency classified material destruction/disposition instructions.

Review the Significant Events Log maintained at your position to ensure you are aware of actions taken or in-progress.

### *Security*

Ensure all classified material is properly controlled and protected.

- Ensure you are familiar with the current duress word(s). Obtain the duress word(s) from the Senior Controller or Logistics Plans Controller.

### *Maintain logs*

Maintain a Significant Events Log. Ensure taskings are answered/completed. Track completion status via the Significant Event Controller Input Worksheet.

Maintain incoming and outgoing message file.

Maintain a file of incoming and outgoing messages.

Maintain a log of all actions, decisions, and status changes during the shift.

Maintain a log of all suspended supply/fuels actions requiring action.

***Miscellaneous***

Ensure supply support operations are in accordance with SBSS policies and procedures as well as any MAJCOM, NAF, or local supplements to those procedures.

**APPENDIX E: INTERVIEW NOTES FROM SITE VISITS AT ALCs OGDEN AND  
WARNER ROBINS**

## **Interview Notes from the Site Visit at ALC Ogden**

These notes are based on handwritten notes taken during interviews. The handwritten notes were reviewed and studied. Comments, conclusions, and interpretations were added. The notes below are a composite that reflects the original inputs received during interviews as well as subsequent additions, without discriminating between the two.

### **1. June 15, a.m., Mike Munson, Judy Valentine / FMMO / (801) 777-5218**

- Main topic: LRC structure and functions. Interviewees described LRC activation procedure, organizations represented in the LRC, and the role of the LRC in crisis situations in general.
- The main functions of the LRC at Ogden ALC are information distribution to functional organizations and information collection and situation update for the ALC Commander. Logistics issues are worked by the functional organizations, i.e., that is where the day-to-day decision making occurs. The LRC is the one place where all ALC business is visible and where coordination between functional organizations can be effected.
- This means that the wartime organization of the ALC is essentially the same as in peacetime. The classic LRC role as a central battle staff that maintains control over all facets of crisis operation is diminished. The decision makers for particular issues sit in the various functional organizations: There is minimal organizational disruption, with the same experts who handle logistics business in peacetime also doing it in wartime.
- Both interviewees were asked to critique a draft logistics training scenario. Both indicated that the training scenario was very realistic and that it did not contain any major misconceptions.

### **2. June 15, a.m., Bob Koldewyn / LI / (801) 777-7753**

- Control Center manager for the Commodities Directorate (LI).
- Logistic taskings arrive at the Control Center; he reviews them and determines which functional organization(s) they go to and sends them on.

- Gave us a good, vivid idea on the large variety of taskings that may occur and how they might be handled.
- Indicated that prioritization across units is often a significant problem. This is of course a classic decision making problem.

**3. June 15, p.m., Steve Thurgood / LAMBL / (801) 777-7104**

- Senior Controller for Aircraft Directorate.
- Described three phases of logistics operation: preparation for deployment, deployment, and sustainment.
- Preparation for deployment is based on an assessment of which units are scheduled to deploy and how ready these units are.
- The assessment looks at WRM shortfalls and prioritizes them by criticality. The process is supported by the WSMIS model, guided by AFR 55-15. Readiness Spares Packages (RSPs) somehow play a role in this predeployment assessment.
- During sustainment the Item Managers are the key decision makers.

**4. June 16, a.m., SMSGT Ouimette / LIWX / (801) 777-5055**

- Indicated that peacetime and wartime jobs for ammunition people are really quite different!
- He apparently had a great deal of responsibility for the performance of LIWX during Desert Storm (DS) and pointed out that the prepositioned ammunition ships in DS were inadequately stocked, that a lot of ammunition had to be stockpiled at DS inception from stores in Europe and PACAF, and that global prepositioning in the future must ensure that all components for full-up ammunitions are together and that old munitions stocks are rotated out.

- The resource pools for ammunition (bombs, missiles, bullets) are apparently Army Depots. Bombs and missiles consist of multiple components (body, fins, guidance units, etc.), which are commonly stored at different(!) depots.
- Munitions are not supplied in response to requests but on the basis of analyzing EARFLAP (Emergency Action Reporting For Logistics Action Programming). The idea is proactive delivery of ammo assets so that objectives like 30/60/90 days of ammo on the ground, in the theater, are satisfied. Anticipated consumption rates can be gleaned from OPLAN.

#### Typical EARFLAP report

Weapons Code	Beginning Balance	Receipts	Expenditures	Shipments	Ending Balance	Remarks
Sequenced by priority DODIC numbers	50	10	10	10	40	

- Must take transportation time into account. Ammo is very heavy, and the most economical way to transport is by ship, which is very slow. High-visibility, "popular" ammo assets, which are in short supply, might get airlifted.
- The decision of where to get ammo components must consider the following factors:
  - Cost.
  - Speed.
  - Logic of balancing inventories.
  - Political factors.
- General process for ammo supply:
  - MAJCOM determines mix of airframes and deploying units for a given threat.
  - They are assigned to bases and the bases develop a 60-day requirement.
  - What is there already gets subtracted from the requirement.
  - Excesses at some bases are sourced to fill requirements at other bases.
  - The rest comes from extra-theater sourcing - Hill ACP.
  - ACP reaches into Army depots.



- Critiqued the draft scenario as basically correct, but must show that for ammo multiple components must be pulled together from multiple sources.

**5. June 16, a.m., SGT. Loveall / LIWX / (801) 777-5055**

- Primary duty: Ensure that EARFLAP reports are received, logged in, and analyzed.
- Analysis: Daily and cumulative ending balances over time give consumption rates, which then need to be bounced against 30- or 60-day requirements.
- Also have a program that shows what is in transit and which shipments made it.
- In sourcing, the first factor is speed: What's quickest? The second factor is balancing the inventory: Old versus New, Excess versus Shortage.
- Example: Need 500K rounds of 30-mm ammo:

Pools	30-mm Inventory	Decision
USAFE	250K	take 250K from here
PACAF	500K	
TAC	1000K	
ARMY DEPOT (CONUS)	250K	250K from here, not from PACAF, because of better airflow
GUARD	100K	
RESERVES	100K	

- Example: Need to source 500 Fins for Mk 82 within C+30

EARFLAP reports on Army Depots in CONUS:

Pools	Fin Inventory	Distance Factor
Depot 1	100 fins extra	nearest to port
Depot 2	1000 fins	500 miles to port
Depot 3	500 fins	1000 miles to port

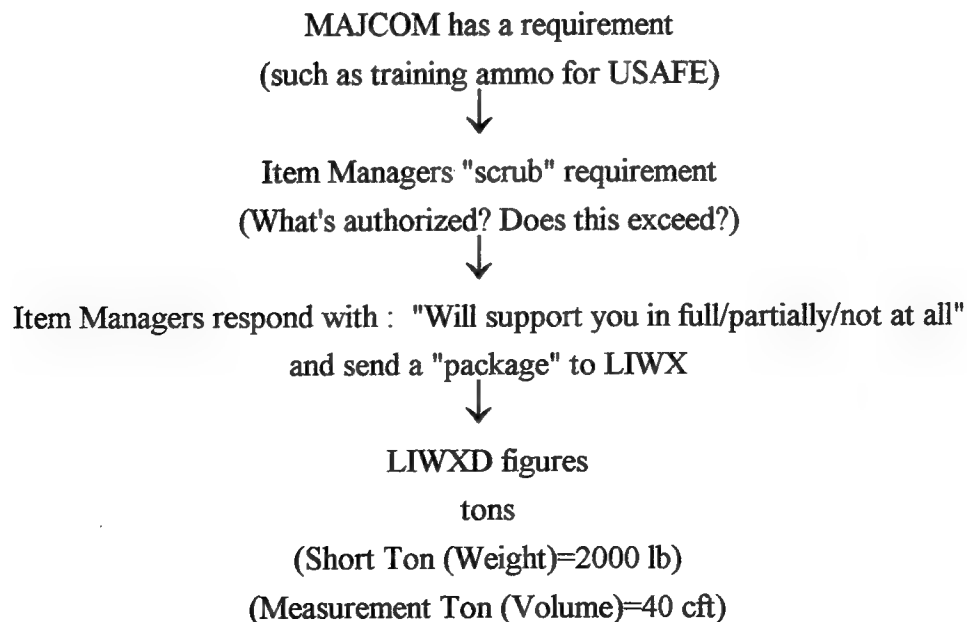
- Questions asked: Where are the depots? Which is closest to an ammo embarkation port?  
What is the simplest way of getting the shipment together?
- Confirmed again the following factors for sourcing:
  - Timing (mode, distance, need date)
  - Cost
  - Inventory balance
  - Simplicity
  - Priority

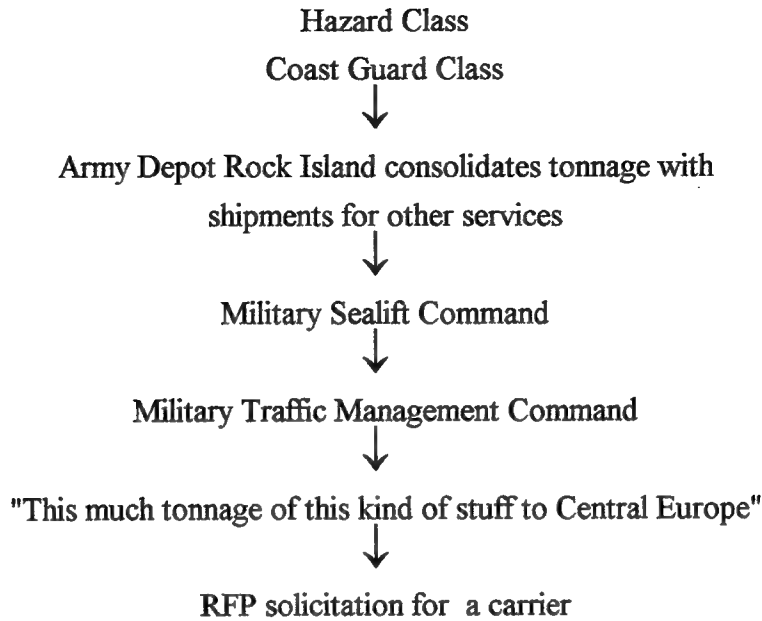
**6. June 16, a.m., SGT Purdy / LIWX / (801) 777-5055**

- Gave us a tour of an Mk 82 guided bomb.
- Gave us a Complete Round Dictionary and explained it.

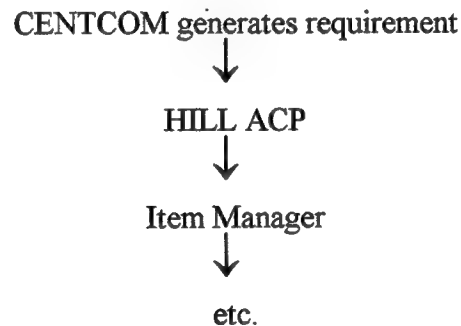
**7. June 16, a.m., Jeff Weeks / LIWXD / (801) 777-5771**

- Jeff Weeks gave us a number of excellent examples illustrating how ammo requirements are handled, with a focus on the transportation issue.
- Example 1:



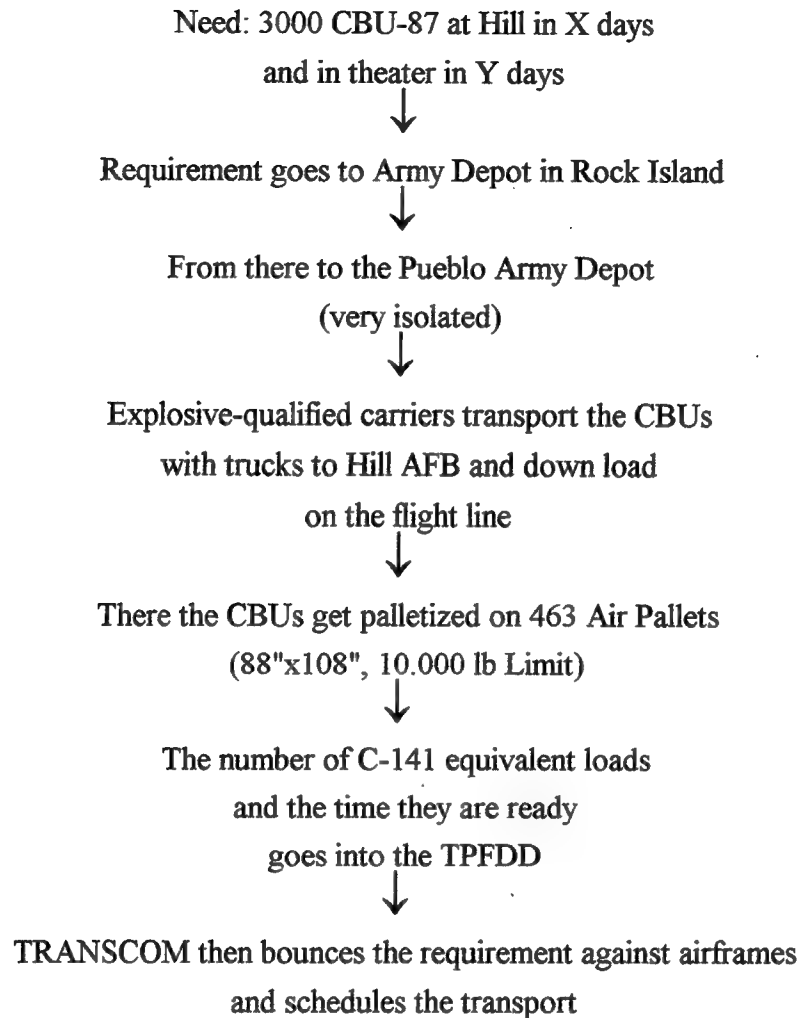


- Note:  $ST/MT < 1$  means light and bulky;  $ST/MT > 1$  means heavy and dense.
- In Desert Storm the first few lines of the example above were different:

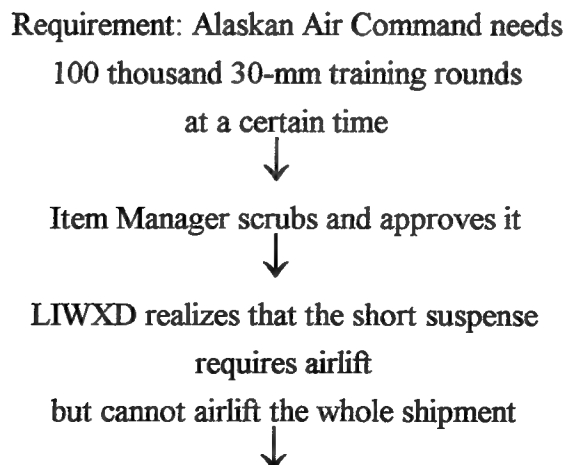


- When assets are distributed over a number of depots, requirements for transportation need to be made known to all.
- Stock may be "serviceable" or "unserviceable." In either case, there are condition codes which provide further detail such as: inspection overdue, surface rust, surface rust but ok for war, etc.

- Example 2:



- Example 3:



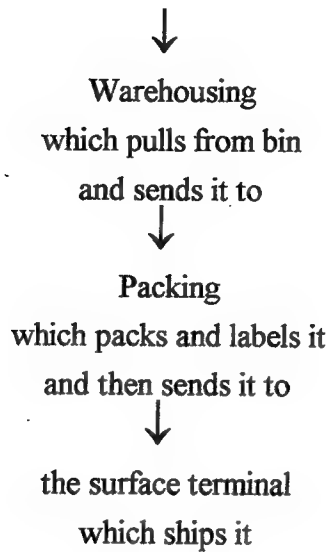
Decision:  
Some airlift  
Rest by Rail-Barge-Rail

- Some considerations:
  - Trucking to Alaska in winter is ok. Trucks can take on full 40,000-lb load. In summer they can only take 20,000 lb because the tundra thaws.
  - Rail: Great! 100K lb to a car, but not available everywhere!
  - Trucks may make a lot of stops to get a full load.
  - Ships: any delay costs \$75K a day!

7. June 16, p.m.,	Devon Talbot	THEC	(801) 777-6610
	Elaine Schenk	TTUB	(801) 777-4065
	Richard Hall	TICC	(801) 777-4507
	Susan Brown	DDOU/THO	(801) 777-4440
	Kathy Hyden	TIDSTMB	(801) 777-4337
	Kathy Morris	TIDTAM	(801) 777-0029
	John Wheeler	TICC	(801) 777-4507

- Quite a gaggle!
- Definition for C-141 Equivalent: What a C-141 can carry over the critical leg
- Problems: stuff not ready for shipment when planned
- Example:

Wing in DHARAN sends requirement for  
canopy actuator for F-16  
↓  
to  
↓  
Prime MICAP Air Force  
which tasks  
↓  
Base MICAP  
which "cuts a shipment"  
which goes to



- MICAP is supported by MASS: MICAP Automated Supply System.
- Typical fields in the TPFDD (74 possible fields):

UTC	Unit Type Code
RLN	Requirement Line Number
Unit	Unit Description (0388 EQMT Maint SQ)
Origin	
PAX	Passengers
Total STONS	Total Weight
DEST	Destination
ALD	Available Load Data
LAD	Latest Arrival Date
RDD	Required Delivery Date

## Interview Notes from the Site Visit at ALC Warner Robins

These notes are based on handwritten notes taken during interviews. The handwritten notes were reviewed and studied. Comments, conclusions, and interpretations were added. The notes below are a composite that reflects the original inputs received during interviews as well as subsequent additions without discriminating between the two.

### 1. June 18, a.m., Paul Wellborn / LKGL / (912) 926-2601

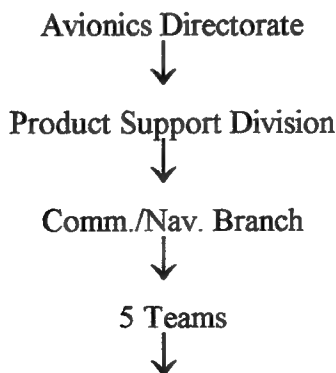
- Supervisory Logistics Management Specialist.
- Brief introduction to ALC Warner Robins mission and structure.

### 2. June 18, a.m., Jerry Tyson / FMPO / (912) 926-5704

- Chief of War Contingency Plans Branch gave us a briefing on LRC structure and functions. LRC at WR is even more decentralized than the LRC in Ogden!
- Provided several pieces of documentation.

### 3. June 18, a.m., Patsy Rooks / LYLCI / (912) 926-9814

- Team Coordinator IM. Explained her organization:



1. Logistics Management Team: organized by Programs, like ARC-164 System.

2. Item Management Team: responsible for individual items in a program, like the Transceiver in the ARC-164 System (by Stock Number).

3. Production Management Team: Repair Services for Recoverable Items.

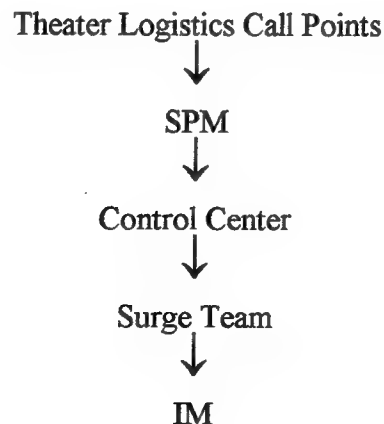
4. Engineering Team: Engineering support for all systems, subsystems (the "degreed" technical arm).

5. Technical Team: Tech Orders, Tech Manuals, Administrative Functions (the "non-degreed" technical arm).

4.	June 18, a.m.,	Gerry Sutton	LYLCI	(912) 926-1267
		Greg Giddens	LYB	(912) 926-0921
		Gail Childress	LYLRI	(912) 926-1342
		Patsy Rooks	LYLCI	(912) 926-9814

Major topic: How are requests/demands handled?

- Form:  
MILSTRIP requisition, containing Stock number, number required, priority, need date, origin, and other data.
- Origin:





- **Process:**

If available and not restricted - automatic shipment. Availability is automatically checked. Restriction Code: Management Review. If not available or if restricted - human intervention. Big drivers: Funds and Policy!

Surge planning looks at items that need to be available within next 30/60, etc., days.

Requirements for X of Y in next 30 days can be filled from

- ORGANIC
- CONTRACTOR
- REPAIR
- SUPPLY

Aircraft are either accelerated or expedited.

Check warehouse, repair needs: if no repairable items are available, can they be accelerated? If acceleration is not possible, can they be bought? Other possible sources are lateral support and cannibalization.

Competing demands are automatically handled by priority codes.

**5. June 18, p.m., Elaine Johnson and Chuck Hughey / LFL / (912) 926-4126/4334**

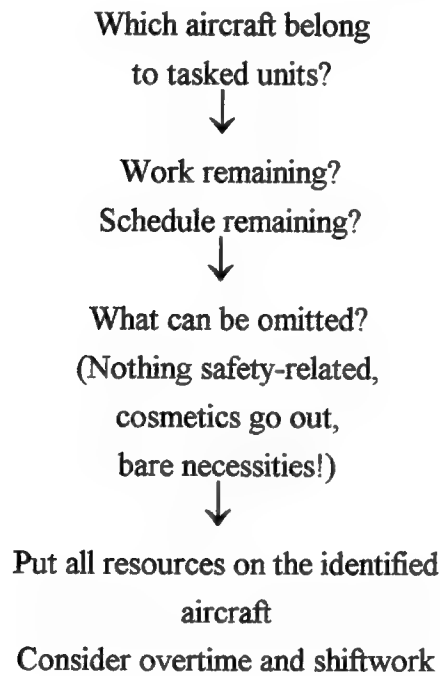
- Elaine provided an exceptionally lucid flowchart for the process of sourcing exchangeables:
- Aircraft Battle Damage Repair: F-15 wing damage
  - What is the extent of the damage?
  - Can it be handled by local repair?
  - Can a depot field team do it?
  - Is a contractor field team required?
  - Does the aircraft have to be brought back?
  - Should the aircraft be used as a hangar queen for cannibalization?
- Unexpected events, such as the pitting by sand of F-15 canopies and of LANTIRN domes, may require engineering fixes.

## Second interview on June 19, p.m.

- Acceleration:

May be initiated upon receipt of a Warning Order or an Alert Order.

Issue: Which aircraft can you get out of the depot faster?



- Addition to exchangeables:

- Local Manufacture possible?
- Local purchase possible?
- Repair of a throw-away possible? (sometimes because buying cheaper than repair)

- Compression: in all-out war situations, only safety of flight items done.

- Serviceable: asset operational, combat ready.

- Repairable: failed unit, must be repaired to become serviceable.

- Competing orders/requirements:
    - Who is tasked?
    - Who has less serviceable assets?
    - What is the actual tasking of the units?
    - Which unit is more vulnerable (e.g., closer to the front)?
    - Precedence?
  - Lateral Support: Wing to Wing.
  - In-theater logistics system was not really visible to ALC folks, very limited communication.
  - Shipments did get lost; there were duplicate shipments.
- 6. June 18, p.m., Paul Wellborn, Betty Thompson / LKGL / (912) 926-2601**
- Provided primer on tactical missiles.
  - Missiles are needed up front, during the first 48 hours, for the establishment of air superiority. There is no real big resupply function, except for the HARM antiradiation missiles.
  - Types of missiles:
 

→ AIM-7	Sparrow, radar, BVR
→ AIM-120	AMRAAM, BVR
→ AIM-9	Sidewinder, IR, IVR
→ AGM-88	HARM, SEAD missile
→ AGM-45	SHRIKE
→ STINGER	GA, shoulder fired
  - Missile breakdown, i.e., generic components:
    - Guidance Section
    - Warhead
    - Target Detector
    - Rocket Motor
    - Wings - Fins - Rollerons
    - Launchers

- Power Supplies
- Support Equipment

- Examples of "logistics problems" with missiles:

Problem 1:

- AIM-9 Power Supply had incidents of uncommanded firings, was very difficult to maintain.
- Engineering fix was developed: modular power supply with remove/replace capability.
- Older power supply is being phased out.

Problem 2:

- Test set TS44-D for guidance/control unit very susceptible to shock and vibration.
- Engineering fix developed and now being implemented (upgrade).

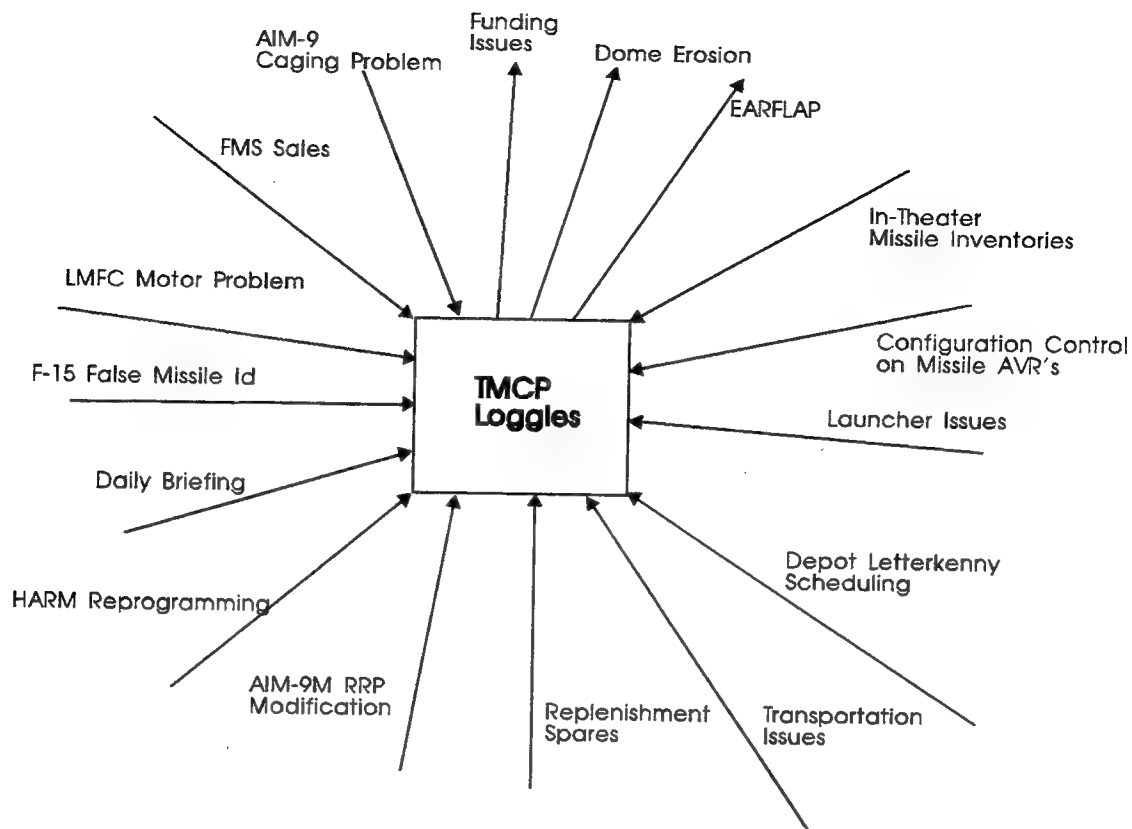
Problem 3:

- Limitation in counter/counter capability was noted.
- Engineering fix: new circuit cards.
- All together, 1008 were modified.

Problem 4:

- AIM-7 Blower Motor cable was defective.
- Engineering fix: new connector was designed.

The TMCP (Tactical Missile Control Post) is embedded in a very extensive and complex network of organizations. "Difficult to build up the knowledge on who does what and who must be contacted for various evolutions."



**7. June 19, a.m., MSGT Johnson / LKGL / (912) 926-2601**

- The inventor and programmer and software engineer of the TMRS: Tactical Missile Record System.
- TMRS is a tool for managing missiles from birth to death, contains data on all missiles in the inventory, including identification, configuration and configuration changes, test data, performance histories, TCTO data (Time Compliance Technical Order), crashes, fires, failure reports - i.e., very comprehensive!!

<b>7. June 19, a.m., Shirley Knowles</b>	<b>DSTDM</b>	<b>(912) 926-3888</b>
<b>Harvey Wynne</b>	<b>DST</b>	<b>(912) 926-6081</b>
<b>James Ellington</b>	<b>DSTDM</b>	<b>(912) 926-2473</b>
<b>Janice McDaniel</b>	<b>DSMT</b>	<b>(912) 926-5652</b>

- Described the Transportation system as a largely automated system that even features automation of decision making functions. Human intervention only in exceptional cases.

The interviewees indicated that there is a definite danger of atrophy of decision making skills!!

- Great advantage of the system: enables much more pro-active operations.

## **APPENDIX F: SCENARIO AND CASE STUDIES**

## **DDT Scenario Nr. 1:**

### **"THE KLINGON INSURRECTION"**

The scenario presented here is the first of two or three scenarios to be developed. The objectives in writing this first scenario are:

1. To develop a concrete example of an artificial logistics decision making domain.
2. To use the domain as the informational background for very specific case studies (Cases 1 through 4) illustrating the decision making process.
3. To use the case studies and the scenario as a basis for system design and prototyping.

This first scenario and the associated case studies should be reviewed and critiqued by Subject Matter Experts (SMEs) before additional scenarios and case studies are developed. For this purpose, we have attached an appendix with instructions to SMEs.

The scenario contains the following elements:

1. Situation Overview
2. SITREP for Operation NUTCRACKER
  - Theater/Location:
  - Deployed Forces:
  - Equipment and Personnel Beddown PLAN:
    - Battle Forces
    - Logistics
3. Inventory and Consumption
  - Critical Item Supply Status Report (or Status Board)
  - Status of Starship Assets on Starbase 10
4. Reference Data
  - S-15 Characteristics
  - AWAX Characteristics
5. Case Studies



Case 1

Case 2

Case 3

Case 4

Appendix

## 1. SITUATION OVERVIEW

Three Earth-weeks ago, the government of the KLINGON planet KHATATT was replaced by a warrior junta under the leadership of Marshal SATASS KHOSSIM. The marshal declared KHATATT's secession from the federation and initiated a campaign to rid KHATATT of all members of foreign species who are not warriors. Open hostilities between resistance fighters loyal to the federation and Khossim's forces started one Earth-week ago. Currently, three-quarters of the planet KHATATT itself and two of its seven colonized moons are firmly in the hands of the secessionist rebel government.

Federation diplomatic efforts to return the situation to normal were answered with a megalomaniac declaration of war. The Federation has dispatched a multi-planetary force (MPF) to Starbase 10 on SUHDI ABARIA to free KHATATT and the occupied moons from Satass Khossim's brutal warrior regime and to return lawful government rule to KHATATT. The MPF started full wartime operations two days ago, on Star Date 0189-56.

The Federation MPF includes a sizable Earth contingent of STARFORCE ships: Two wings of S-15 Starfighters and one squadron of AWAX battle control and disrupter ships. The mission of this contingent is referred to as Operation NUTCRACKER.

Logistics sustainment for Operation Nutcracker is coordinated by the Ogden Star Logistics Center (SLC). The remaining SLCs and subordinate depots have been instructed to support Ogden to the greatest extent possible without jeopardizing current training schedules and defense postures. The current sustainment objective is to keep a minimum of 30 days of support on the ground at Starbase 10.

You are currently dedicated to the Contingency Action Team at Ogden SLC, which coordinates and controls all logistics support operations for Operation NUTCRACKER. You are a Supply specialist, and whether or not Operation NUTCRACKER will have adequate supplies to conduct its mission will depend on your decisions.

## 2. SITREP FOR OPERATION NUTCRACKER

### THEATER/LOCATION:

Starbase 10 on Suhdi Abaria, 6th planet in star system Beta Tau.

Base has standard outpost infrastructure.

3 parsecs from Earth.

.5 parsecs from KHATATT.

### DEPLOYED FORCES:

16th Starfighter Wing "Grissom."

23rd Starfighter Wing "Zapata."

1122nd Awax Squadron "Thor."

522nd Starport Support Squadron.

### EQUIPMENT AND PERSONNEL BEDDOWN:

	16th SFW	23rd SFW	1122nd ASqdn	522nd SSSqdn
<b>Space Combat Ships</b>				
Type	S-15	S-15	AWAX -B1	N/A
Number deployed	15	15	5	N/A
<b>Ground Vehicles</b>				
Maintenance Rover	4	4	2	4
Weapons Rover	4	4	2	
Loader, heavy				2
Loader, light	1	1	1	5
Construction Rover				4
Personnel Rover	2	2	1	4
Combat Rover, medium				6
Combat Rover, light	3	3	1	6
<b>Personnel</b>				
Ship crews*	18/1	18/1	6/11	N/A
Maintenance crews*	3/10	3/10	1/12	N/A
Starport support crews*	3/3	3/3	1/6	1/112

\* Number of crews / number of people per crew.

## **OPLAN:**

### **Battle Forces:**

16th and 23rd SFW: Until further notice, maintain blockade screen between KHATATT and each of the two occupied moons CASSIUS and CLAY. For each moon, maintain continuous StarCAP with 2 fighters on station, 2 on 5-min alert and 4 on 15-min alert. ROE: Engage and destroy any positively identified KLINGON space vehicle that does not comply with warnings and instructions.

1122nd ASqdn: Maintain continuous surveillance of KHATATT system. Provide continuous C2 services for StarCAP fighters. Establish and maintain a patrol orbit between Suhdi Abaria and KHATATT. Keep one ship on station at all times and one ship on 15-min alert at Starbase 10.

522nd SSSqdn: Continue to provide Starbase survival and defense support. Continue efforts to secure Starbase 10 against ground attacks by KHOSSIM guerrillas and against long-range suicide missions from KHATATT.

### **Logistics:**

Ogden SLC: Maintain continuous supply availability for a minimum of 30 Stardays of continuous StarCAP operations.

### Critical Items List

Ensure uninterrupted supply of the following critical items listed in priority order:

1. S-15 Engines.
2. R2D2 Navigation & Weapons Robots.
3. S-15 Gallium Fuel Canisters.
4. PT-9 Racks for Photon Torpedoes.
5. AP-Mk.2 Alias Projectors.
6. R2D3 Navigation & Weapons Robots.

### 3. INVENTORY AND CONSUMPTION

#### CRITICAL ITEM SUPPLY STATUS REPORT (OR STATUS BOARD):

Unit Item ID	Serviceable On-Hand	In Maint.	DIFM	Total Spares	Usage Rate	Deliv. Sched	Next Due	Remarks
<b>16th SFW</b>								
S-15 Engines	6	3	3d	9	1/3d	3/9d	3d	
R2D2								
S-15 Fuel Can.								
PT-9 Racks								
AP-Mk.2								
R2D3								
<b>23rd SFW</b>								
S-15 Engines	7	2	4d	9	1/3d	3/9d	3d	
R2D2								
S-15 Fuel Can.								
PT-9 Racks								
AP-Mk.2								
R2D3								

#### STATUS OF STARSHIP ASSETS ON STARBASE 10:

Unit	Ship Type	In Theater	Full Combat Capable	Limited Combat Capable	In Maintenance
<b>16th SFW</b>					
1601 Sqdn	S-15	15	10	2	3
1602 Sqdn	S-15	15	13	1	1
1603 Sqdn	S-15	15	14		1
<b>23rd SFW</b>					
2301 Sqdn	S-15	15	8	4	3
2302 Sqdn	S-15	15	15		
2303 Sqdn	S-15	15	11	3	1
1122 ASqdn	AWAX	5	4	1	

## 4. REFERENCE DATA

### S-15 CHARACTERISTICS:

<b>Crew:</b>	1 Pilot 1 R2D2 Backseat Navigation and Weapons Robot
<b>Engines:</b>	2 WARP Capable GP-26A Engines
<b>Fuel / Fuel Load:</b>	Gallium Crystals / 4 Canisters
<b>Combat Avionics:</b>	1 High Performance Traceless Sensor Pack HPTSP50-1
<b>Defensive Systems:</b>	General Purpose Shield GPS-15
<b>Offensive Systems:</b>	2 Phaser Disrupter Cannons, Range 50K km Photon Torpedo Launch System (External Racks)
<b>Weapons Loads:</b>	4 Photon Torpedoes, Medium Range, PT-465 2 Alias Projectors AP-Mk.2 4 Guided A/G Buster Bombs GBU-74

## AWAX CHARACTERISTICS:

<b>Crew:</b>	1 Pilot 1 Battle Captain 1 Sensor Systems Operator 3 Battle Control Specialists 3 Disrupter Operators 2 Engineers 1 R2D3 Navigation and Weapons Robot
<b>Engines:</b>	4 WARP Capable GP-19B Engines
<b>Fuel / Fuel Load:</b>	Compressed Biomass / 22 Cakes
<b>Combat Avionics:</b>	1 C2 Battle Management System with Long-range Sensor Pack and Holographic Display Capability
<b>Defensive Systems:</b>	1 Full Frequency-range, Super-shield System 1 Tractor Beam Deflector 1 Tractor Beam 1 Remote Masher
<b>Offensive Systems:</b>	16-Turret, Phaser Disrupter System, Range 75K km 1 Photon Torpedo Launch System (Internal Launch Tubes)
<b>Weapons Loads:</b>	200 Photon Torpedoes, Long Range, PT-485 2 Alias Projectors AP-Mk.2 300 Disrupter Charges

## **5. CASE STUDIES**

The case studies are concrete (albeit hypothetical) examples that illustrate how a student (S.) makes a decision in a specific case.

The case studies are presented in a three-column format. The first column describes the decision making process in terms of what the student sees and does. The second column gives an interpretation of the first in terms of the Decision Making Model. The third column describes the student interface requirements for each of the steps in the decision making process.

An attempt has been made to generate a set of fairly divergent cases, where each case focuses on different uncertainty reduction requirements. Each of these case studies needs to be validated by SME review and critique (see appendix).



# Case 1

DM Process in a STAR WORLD Scenario	DM Model Interpretation	Student Interface Requirements
<p>S. receives the daily Critical Item Supply Status Report (CISSR) from Starbase 10.</p> <p>One line of the report deals with supply of S-15 engines at 16th SFW.</p>	<p>Presentation of eliciting stimulus material.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• announcement that a report has arrived</li> <li>• means to retrieve and display that report</li> <li>• means for student to indicate that he is looking at the line dealing with engine supplies at the 16th SFW</li> </ul>
<p>S. sees that 16SW Maintenance Squadron</p> <ul style="list-style-type: none"> <li>• has 6 serviceable spare S-15 engines</li> <li>• and has 3 in maintenance</li> <li>• that are expected to be fixed (DIFM) in 3 days, making</li> <li>• a total of 9 spares;</li> <li>• is consuming spares at a rate of 1 every 3 days,</li> <li>• with a resupply schedule of 3 spares every 9 days,</li> <li>• the next 3 spares being due in 3 days.</li> </ul>	<p>Situation information in raw form, i.e., "data." S. looks at these data, tries to make sense of them, transform them into useful info to determine whether there is a need and an opportunity for a decision.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to discover what the student is looking at: mask data in all cells, clicking uncovers the mask (for a limited time?)</li> <li>• to tag info as Sit. info, since this is prior to Recognition Point and S. should be looking at situation info relevant to the "issue" of S-15 engines</li> <li>• to script the situation regarding S-15 engines during exercise generation</li> </ul>
<p>9 spares should last 27 days. Squadron should have a minimum of 30 days of engines on hand. Ergo, they are now 1 engine short of the minimum requirement.</p>	<p>Derived Situation Information: Now he knows what's really going on.</p>	<p>Nice to have:</p> <ul style="list-style-type: none"> <li>• something like an electronic scratchpad</li> </ul>
<p>S. realizes he must decide something here.</p>	<p>Recognition Point.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means for the student to indicate that he has recognized a decision problem</li> </ul>
<p>S. also concludes his two basic types of options are:</p> <ol style="list-style-type: none"> <li>1. Do nothing right now.</li> <li>2. Increase supply of engines for the 16th.</li> </ol>	<p>Formulation of basic option types.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• window to formulate basic option types. This window should either pop up automatically when he indicates recognition (which is good for early learning stages) or he should have to get it himself (which might be used during later stages)</li> </ul>

<p>S. makes a best case/worst case prediction:</p> <p><u>Best case</u>: 3 days from now 16SW has <math>6+3+3-1=11</math> spares, i.e., enough for 33 days at the current consumption rate.</p> <p><u>Worst case</u>: 3 days from now the 3 new ones arrive, 2 of those in repair need to go back to earth, and 3 more engines have gone sour and have to be repaired, with 1 of those a clear depot case. The other 2 are expected to be back out of repair no earlier than 6 days later, i.e., in the worst case 16SW would have <math>6+3-2-1=6</math> spares on hand, or enough for 18 days.</p>	<p>He develops <u>derived</u> Situation Information: Extrapolation into the near or "foreseeable" future.</p>	<p>Nice to have:</p> <ul style="list-style-type: none"> <li>• a scratchpad</li> </ul>
<p>S. checks the CISSR to see how the other S-15 wing on Starbase 10 is doing on engines. That information is in the same report that applies to his squadron. The sister wing could be doing about the same, a lot better, or a lot worse.</p>	<p>He identifies a need for more Sit. Info and accesses a correct, not previously accessed source.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means for S. to indicate that he wants to get more Sit. info</li> <li>• means to identify what he is accessing</li> <li>• to identify, tag, status info as Sit. info</li> </ul>
<p>As it turns out, the sister wing at Starbase 10 is in about the same situation with regard to engines.</p> <p>Now S. knows that both wings are on the verge of getting low on engines. Nothing serious yet, but the chance of a serious engine shortage has just doubled. His concern about the supply of engines heightens.</p>	<p>Reads, assimilates Sit. info.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• to script the situation at the sister wing (brother wing?) during E-Gen</li> </ul>
<p>S. now intends to determine whether the consumption rate might take a turn for the worse in the near future, i.e., during the next 3 to 12 days. If the operational situation requires more sorties, the consumption rate will rise. If many engines in the fighters are nearing a range of service hours where failure rates start increasing, the consumption rates will rise.</p>	<p>S. identifies the need for a special kind of Sit. info: info about the future, predictive info.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• a means for S. to indicate that he wants more Sit. info, perhaps even that he wants <u>predictive</u> Sit. info</li> </ul>

<p>S. checks the OPLAN: No indication that sortie rates may go up or down in the near future.</p> <p>The desired info is absent. It may be absent because there really is no cause for alarm or it may be that the info is not known.</p>	<p>Accesses correct predictive info source.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to access the OPLAN</li> <li>• for OPLAN info to be tagged as predictive Sit. info</li> </ul>
<p>S. tunes his TV to McNeill-Lehrer and to CNN: Nothing definite there either although he learns that Satass Hussim apparently has many more unmanned SCUM ships than Starfleet suspected.</p>	<p>Still checking predictive situation information. Receives new predictive situation information.</p>	<p>Nice to have:</p> <ul style="list-style-type: none"> <li>• extraneous, "unofficial" info sources, tagged as providing Sit. info</li> <li>• the information in the unofficial sources to be scripted during exercise generation</li> </ul>
<p>More SCUM ships means that the two S-15 squadrons may get a lot busier than they are now, and that means more sorties and more engine failures.</p>	<p>Draws conclusions from new predictive situation information. The conclusions support the "increase flow" option class.</p>	<p>Nice to have:</p> <ul style="list-style-type: none"> <li>• scratchpad</li> </ul>
<p>S. tasks a sergeant to look at the service records of all the S-15 engines in the fighters at STARBASE 10.</p>	<p>Queries another information source for predictive situation information.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• something like an all-purpose info source identified as "sergeant" or as "guru"</li> <li>• means to query for selected supply item characteristics</li> </ul>
<p>The sergeant finds no cause for alarm; in fact, most of the engines are very "young," i.e., low in hours.</p>	<p>Response to query. This information does not support the "Increase Flow" option, but it does not ipso facto support the "do nothing" option.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• to provide some reasonable form of query response</li> <li>• to script these engine characteristics during exercise generation</li> </ul>

<p>At this point S. has essentially exhausted things he can easily check. More situational info would cost a lot of time, effort, and good will; and the chances that this info would be definitive, or any better than what he already has, are low to very low. The point of diminishing returns is reached.</p> <p>Since both wings are at the edge and since there is a potential for an increased SCUM threat, he feels that the "Increase Flow" option is the better option to pursue.</p>	<p>He has now edited the options down to one class of options. The "do nothing now" class is out.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to edit options</li> </ul>
<p>S. decides he should increase the flow to 4 or to 5 every 9 days.</p> <p>4 is the lower limit for an increase and 5 is the upper limit, as S. decides that more than 5 would cause severe feasibility problems besides being overkill.</p>	<p>Starts to specify two options within the remaining option class.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to edit options</li> </ul>
<p>S. now wants to know whether</p> <ul style="list-style-type: none"> <li>• the supply ships have the additional cargo capacity, and</li> <li>• whether the supply pools can supply 1 or 2 more engines every 9 days.</li> </ul>	<p>Identifies need to attack feasibility uncertainty for the two options with priority. There are two issues related to feasibility:</p> <ul style="list-style-type: none"> <li>• transportability and</li> <li>• availability.</li> </ul>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means for S. to indicate that he wants to get feasibility info</li> </ul>
<p>S. calls Transportation folks and asks whether they can handle either 1 or 2 more engines every 9 days.</p>	<p>Queries correct source on feasibility info in regard to transportation issue.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to query an object</li> </ul>
<p>The Transportation folks reply that cargo capacity is no problem. They can handle it without tasking more freighters.</p>	<p>This reduces the feasibility uncertainty with respect to the transportation issue to zero.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to compute a reply from properties of that object</li> </ul>
<p>S. then calls the Item Manager (IM) for S-15 engines and asks whether he can supply 1 or 2 more S-15 engines every 9 days.</p>	<p>Queries the correct source to check on the availability issue.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to query an object</li> </ul>

The IM replies that 1 more engine every 9 days can be handled very easily by the system for at least the next 2 months. 2 more engines every 9 days would begin to impact other commitments (training and defensive posture).	This provides the required feasibility info and it essentially says that one of the two options is more feasible than the other.	Need: <ul style="list-style-type: none"> <li>means to compute a reply from properties of that object</li> </ul>
S. now has an option that has a high probability of satisfying the goal of keeping the supply of engines at the 30-day mark. The option also has a high probability of being feasible. There is, however, some remaining uncertainty regarding the future engine situation at Starbase 10: Will it deteriorate or will it not? The chances look 50/50!  He decides to increase the pipeline flow by 1 engine every 9 days.	This is it: The DP!	Need: <ul style="list-style-type: none"> <li>means for student to select an option and to indicate that this is his decision</li> </ul>
S. tasks Depot 14 to send 1 serviceable engine every 9 days to Ogden. First engine is due at Ogden at Star Date 0189-65.	This is a necessary implementation step.	Need: <ul style="list-style-type: none"> <li>means for S. to indicate that he wants to do an implementation action</li> <li>some implementation order form</li> </ul>
Depot 14 sends a message back saying WILCO.	This is feedback on the implementation order that says Depot 14 will comply, i.e., the ball is in their court now.	Need: <ul style="list-style-type: none"> <li>feature that provides acknowledgement replies from objects</li> </ul>
S. tasks the ATOC and the TCU at Ogden to transport 4 engines (instead of 3) every 9 days to Starbase 10.	This is also a necessary implementation step.	Need: <ul style="list-style-type: none"> <li>means for S. to indicate that he wants to do an implementation action</li> <li>some implementation order form</li> </ul>
The ATOC and the TCU phone him saying OK.	Feedback.	Need: <ul style="list-style-type: none"> <li>feature that provides acknowledgement replies from objects</li> </ul>
S. informs the two Maintenance Squadrons of the 16th SW and the 23rd SW at Starbase 10 of the pending increase in pipeline flow.	This is a complementary implementation step.	Need: <ul style="list-style-type: none"> <li>some general message output feature (which may or may not actually send a message to an object)</li> </ul>
The two Maintenance Squadrons from Starbase 10 say: That's great!	Again feedback: now S. knows that they know that the engine supply is about to get better.	Nice to have: <ul style="list-style-type: none"> <li>acknowledgement feature for general message output</li> </ul>

S. now turns to other parts of the Supply Status Report and encounters the next decision problem.		
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## Case 2

DM Process in STAR WORLD Scenario	DM Model Interpretation	Student Interface Requirements
S. is analyzing the Critical Item Supply Status Report (CISSR).	Presentation of the eliciting stimulus material.	Need: <ul style="list-style-type: none"> <li>report presented in a scrollable window</li> </ul>
S. is looking at the line for S-15 Fuel Canisters.	Focus on a part of the eliciting stimulus material.	Need: <ul style="list-style-type: none"> <li>means to indicate what S. is focusing on</li> </ul>
S. sees that 16th SFW has discovered container problems and that they are down to 10 days of supply at current usage rates.	S. transforms data into meaningful information.	Nice to have: <ul style="list-style-type: none"> <li>scratchpad</li> </ul>
S. realizes there is a severe problem that will very soon have a direct impact on Operation NUTCRACKER's ability to perform its assigned mission. He must get more fuel canisters to the 16th quickly. The question is how and how many.	Recognition Point (RP): 30-day sufficiency criterion is clearly violated (Goal info in OPLAN).	Need: <ul style="list-style-type: none"> <li>button for S. to indicate RP</li> </ul>
S. decides he has basically three types of options: 1. a "special" from Earth. 2. a "lateral" from the 23rd. 3. a combination of "special" and "lateral."	Formulation of basic option types.	Need: <ul style="list-style-type: none"> <li>window for S. to formulate Basic Option Types. Should either pop up when he indicates RP (early learning stages) or S. should have to get it himself (later learning stages)</li> </ul>
But, first things first: S. feels he has to have a better picture of the causes and the scope of the problem before he tries to solve it. He therefore looks in the Special Remarks section of the report.	Identifies need for more Sit. info and accesses an appropriate source.	Need: <ul style="list-style-type: none"> <li>a "menu" where S. can indicate which of five classes of info he wants</li> <li>ability to scroll report</li> <li>means to "see" what S. is looking at</li> <li>to tag that section as source for Sit. info</li> </ul>

<p>S. learns there that routine inspections performed yesterday revealed that numerous canisters have container breaches that have exposed the gallium crystals and have turned them to dust, thus rendering the canisters unserviceable and unrepairable. Further inspection revealed that all affected canisters were made by HUGE Spacecraft Company and that they all came from one production run. All canisters that arrived with the latest shipment were from that run and of course all of them are useless spacejunk now. Sabotage is suspected. Heads will roll.</p>	<p>S. reads and assimilates the desired additional Sit. info.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• to script this fuel canister story during exercise generation</li> </ul>
<p>As S. is reading all this in the Special Remarks section of the report, he receives notice that there is an urgent message for him from the 16th SFW on a classified intergalactic spacecomm channel.</p>	<p>This simulates that message traffic goes on whether he is in the midst of something or not. He must attend to the message announcement since it <u>could</u> have something to do with his problem.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to announce arrival of a message</li> <li>• means to schedule arrival of a message</li> </ul>
<p>S. punches in his access code and sees and hears Wing Commander Ace Hotshot telling him basically the same story he just read in the report. Ace concludes his message by thundering that if he did not get them more fuel canisters <u>muy pronto</u>, and not this (expletive deleted) junk from HUGE, his (anatomical part deleted) would be grass.</p>	<p>This message presents Sit. info. There is no new Sit. info here, but it <u>confirms</u> Sit. info already accessed.</p> <p>There is a bit of a stress stimulus!</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• to script message during exercise generation</li> <li>• a means to present the message</li> </ul> <p>Nice to have:</p> <ul style="list-style-type: none"> <li>• message presentation using a video clip</li> <li>• access code feature</li> </ul>



<p>S. is now quite well informed regarding the causes of the sudden shortage. But he does not yet have the full picture regarding scope. He checks the fuel canister line for the 23rd SFW:.....</p>	<p>S. identifies need for additional Sit. info and accesses correct, not previously accessed source.</p>	<p>Need</p> <ul style="list-style-type: none"> <li>• means for S. to indicate that he wants to get more Sit. info</li> <li>• means to "see" S. scroll to the fuel canister line for the 23rd SFW</li> </ul>
<p>.....they seem to be awash in canisters: at least 40 days worth of supply at current sortie rates. Nothing under Remarks.</p>	<p>Scope clear now. The received information also is useful for the lateral option type: It indicates that there is some availability.</p>	<p>Nada</p>
<p>S. calls his Supply buddy Ensign Fred Hamster at the 23rd (on the same classified intergalactic spacecomm channel) to find out whether they had discovered any container breaches (or any other problems).....</p> <p>.....and whether they could help the 16th with some lateral support in a pinch.</p>	<p>Identifies need to confirm and/or get more detail regarding the availability issue for the lateral option. Accesses the right source with a query. Includes in the query a question regarding "willingness" to support a lateral (a special feasibility issue for laterals)</p>	<p>Need :</p> <ul style="list-style-type: none"> <li>• means for S. to indicate what type of info he wants, what issue(s) he wants to address, and what option or option class it is for</li> <li>• some mechanism and/or form to formulate a query</li> </ul>
<p>Ens. F. Hamster indicates that none of their canisters were in any way defective and that none of them were made by HUGE anyway; theirs were all from the Volkscruiser company.</p> <p>And as far as helping out was concerned: His commander, Rocket Twoscore, was not going to impair his outfit's ability to perform the mission, unless STARFLEET HQ would tell him to do so. No (expletive deleted) way!</p>	<p>The accessed source provides reply to the query for confirming availability info. The availability issue is now clarified.</p> <p>The accessed source provides reply to the query for willingness info. The willingness issue is now clarified.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• to come up with a reasonable way to provide information in response to a query</li> <li>• to display that information at bottom of query window or as separate window</li> </ul>

S. now wants to check canister availability at the Ogden Propulsion, Oxygen and Lubricants (POL) farm.	S. identifies the need to check the availability issue of feasibility for the "special from earth" class of options and he accesses a correct source.	Need: <ul style="list-style-type: none"> <li>means for S. to indicate that he wants to: deal with the option class "special...", get feasibility info and clarify the availability issue</li> </ul>
<p>S. zaps the report and Commander Ace Hotshot's tirade over to them, and asks whether they can get 1680 canisters (none of them from the suspicious HUGE production run) ready for shipment "muy pronto" and how long it would take them.</p> <p><i>The availability issue seems to break down into a number of subissues:</i></p> <ul style="list-style-type: none"> <li>• <i>Source.</i></li> <li>• <i>Amount.</i></li> <li>• <i>Timing.</i></li> </ul>	<p>To check availability for this option class he not only needs to figure out <u>where</u> he can get stuff but also <u>how much</u> stuff he needs and <u>how soon</u>. He figures he needs 1680 canisters and he needs them muy pronto. So he queries the likeliest source as to whether it can satisfy that requirement, i.e., he gathers feasibility info for this option class.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>means to formulate a query</li> </ul> <p>Nice to have:</p> <ul style="list-style-type: none"> <li>a zapping mechanism (some kind of cc thing)</li> <li>a scratchpad for figuring</li> </ul>
The POL folks respond with a resounding "No sweat, by tomorrow 16:00 hours."	Response to query on availability.	Need: <ul style="list-style-type: none"> <li>a reasonable way to produce a response to a query</li> </ul>
S. wipes his brow, tells the POL folks to stand by, pops an energizer and picks up his communicator again.	S. saying "Standby" means that he continues to be in the info gathering mode, i.e., he has not yet made a decision.	<p>Nice to have:</p> <ul style="list-style-type: none"> <li>some feature for responding to a reply to a query. Nonessential, but neat!</li> </ul>

<p>This time S. calls the Transportation folks. He talks to the head ATOC "guy," a female Space Major of apparently Romulan descent with a gimpy leg:</p>	<p>S. identifies the need to tackle the "transportability" issue of feasibility and accesses the correct, not previously accessed source.</p>	<p>Need:</p> <ul style="list-style-type: none"><li>means for S. to indicate that he wants to: deal with the "special..." option class, get feasibility info, and clarify the transportation issue</li></ul>														
<p>"Can you transport 1680 S-15 Fuel Canisters to STARBASE 10 within a timeframe that might reasonably be called 'muy pronto'? The things could be at the dock and ready for loading by 16:00 tomorrow."</p>	<p>His query describes the essential parameters of the transportation problem (what, how many, when, when ready) and asks whether the transportation folks can solve it, i.e., "Is it feasible to solve this problem?"</p>	<p>Need:</p> <ul style="list-style-type: none"><li>some mechanism and form for formulating a query, perhaps like this:</li></ul> <div><p><b><u>Query</u></b></p><table><tr><td>Option Class:</td><td>Special from</td></tr><tr><td>Type of Info:</td><td>Feasibility</td></tr><tr><td>Issue:</td><td>Transportability</td></tr><tr><td>What:</td><td>S-15 Fuel</td></tr><tr><td>How Many:</td><td>1680</td></tr><tr><td>When:</td><td>Muy Pronto</td></tr><tr><td>When Ready:</td><td>Next day, 16:00</td></tr></table></div>	Option Class:	Special from	Type of Info:	Feasibility	Issue:	Transportability	What:	S-15 Fuel	How Many:	1680	When:	Muy Pronto	When Ready:	Next day, 16:00
Option Class:	Special from															
Type of Info:	Feasibility															
Issue:	Transportability															
What:	S-15 Fuel															
How Many:	1680															
When:	Muy Pronto															
When Ready:	Next day, 16:00															
<p>The gimpy, Romulan space major Speedy Haulit (a rather frequent Romulan name) indicates that she can only get half of that fuel canister cargo underway tomorrow and that the other half would have to wait 3 days. But the half that would get underway tomorrow would be going by a hyperwarp freighter and would be at STARBASE 10 within 1 earth day.</p> <p>She could also ship the whole shebang in 3 days with an arrival date in theater 6 days from now.</p>	<p>Reply to information query.</p> <p>The reply specifies two options for transportation.</p>	<p>Need:</p> <ul style="list-style-type: none"><li>a reasonable way to provide information in response to a query</li><li>to display the response information at the bottom of the query window or as a separate message window</li></ul>														
<p>S. wipes his brow again and tells the majorette to stand by.</p>	<p>Reply to response indicates that the DP has not yet been reached.</p>	<p>Nice to have:</p> <ul style="list-style-type: none"><li>some feature for responding to a reply to a query. Nonessential, but neat!</li></ul>														

<p>He takes stock now. First he specifies exactly what he wants to achieve:</p> <p><u>Goals:</u> Correct fuel canister supply deficiency at the 16th SFW "muy pronto."</p> <p><u>Options:</u></p> <ol style="list-style-type: none"> <li>1. Half "muy pronto" with arrival in 2 days and half with arrival in 6 days.</li> <li>2. All in one load with arrival in 6 days.</li> </ol>	<p>This is a step that might be called: "Making the goals explicit."</p> <p>This is called "editing the options."</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• options window where he can write down, formulate, make explicit, specific goals and specific options</li> </ul>
<p>S. likes the first option because it will partially pacify Ace Hotshot, except the stuff would have to be hauled in two loads.</p> <p>S. thinks the second option is only good if he can get assurance of lateral support from Rocket Twoscore - just in case the 16th runs out before the new shipment gets there.</p>	<p>S. assesses the options.</p>	<p>Nice to have:</p> <ul style="list-style-type: none"> <li>• some type of scoring feature for each of the defined options here. He should be able to relate expected option effects to goals: "What is the estimate of success for each option in relation to satisfying each goal?"</li> </ul>
<p>S. decides to go for the first option.</p>	<p>This is it: the Decision Point (DP)!</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• a means for S. to select an option as the decision</li> </ul>
<p>S. calls the POL folks and tells them to get 840 canisters to the dock by tomorrow no later than 16:00 and another 840 3 days from now by 08:00.</p>	<p>Required implementation step.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means for S. to say that he wants to do an implementation step</li> <li>• some implementation order mechanism and form</li> </ul>
<p>They say again: "Okie doke, no sweat!" (Wonderful people!)</p>	<p>Reply, confirmation of implementation step.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• some mechanism to provide a confirming response to an implementation order</li> </ul>

S. calls Major Haulit and tells her he needs 840 canisters to go tomorrow and 840 in 3 days as previously discussed.	Required implementation step.	Need: <ul style="list-style-type: none"> <li>• means for S. to say that he wants to do an implementation step</li> </ul>
Haulit, in her funny Romulan accent, says, very formally and officiously: "WILCO, Sir!"	Reply, confirmation of implementation step.	Need: <ul style="list-style-type: none"> <li>• some implementation order mechanism and form</li> </ul>
And S., relieved of his burdens, begins to ruminate about the romantic customs of Romulan females.	Nonessential but motivating.	Multimedia interlude??

## Cases 3

DM Process in STAR WORLD Scenario	DM Model Interpretation	Student Interface Requirements
S. receives an announcement that several messages have arrived.	Eliciting stimulus.	Need: <ul style="list-style-type: none"> <li>• means to announce arrival of messages</li> <li>• means to schedule arrival of messages</li> </ul>
<p>S. accesses the first of these messages and learns the following: "Starfleet intelligence has reliable indications that the SCUM ship threat from Satass Khossim's insurgent forces must now be taken seriously for two reasons:</p> <ol style="list-style-type: none"> <li>1. AWAX long-range sensors have detected large numbers of SCUM ships at two Khatatt launch sites.</li> <li>2. Analysis of sensor data indicates that a high percentage of these SCUM ships are the newest SCUM-6 Model. That model has a jamming capability that can totally scramble the brains of the R2D2's in the S-15's."</li> </ol>	Stimulus material providing situation information.	Need: <ul style="list-style-type: none"> <li>• means to access an announced message</li> <li>• to display a message in a window</li> <li>• to script eliciting messages during exercise generation</li> </ul>



<p>S. takes stock at this point:</p> <p><u>Goal:</u> Provide the S-15 units on STARBASE 10 with at least one of the fixes asap.</p> <p><u>Options:</u> 1. Send Team to do software fix. 2. Send boards for hardware fix. 3. Send both with same freighter.</p>	<p>Formulating the goal and the basic classes of options.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>options window with space to formulate goals and option types and specific options</li> </ul>
<p>A quickie call to Speedy Haulit, the Romulan majorette, determines that she could have the team or the boards or both on the next hyperwarp freighter to STARBASE 10 by tomorrow.</p>	<p>Identifies feasibility/transportation issue as key issue. Accesses correct source with a query. Query gets answered.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>means to formulate a query</li> <li>means to provide a response to a query</li> </ul>
<p>All three option types are equally feasible, i.e., neither availability nor transportability is an issue.</p> <p>S. is now wondering what the best course of action might be, which of the options he should commit to.</p> <p>He likes the hardware option, because it has both defensive and offensive effects.</p>	<p>Option assesment shows that feasibility is given for any type of option.</p> <p>Feasibility therefore does not discriminate between the options.</p> <p>He turns to option effects uncertainty and starts to differentiate the option types on that basis.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>options window, with a means to compare feasibility and effects uncertainty between the options</li> </ul> <p>Nice to have:</p> <ul style="list-style-type: none"> <li>scratchpad</li> </ul>
<p>Time seems to be of the essence since Khossim could launch these boogers any time now.</p> <p>S. wonders how long it will take to install either the hardware or the software fix.</p>	<p>He singles out time as a critical variable.</p> <p>He now intends to clarify the timing issue under effects uncertainty.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>means for S. to indicate that he wants to have effects info for option types 1 and 2</li> </ul>



S. queries Starfleet Logistics Command for that information. They don't know.	He accesses an appropriate source but that source is dry.	Need: <ul style="list-style-type: none"> <li>• query and response mechanism</li> </ul>
S. tries to reach the team at Hill, but cannot.	He accesses another appropriate source and that one is dry too.	Need: <ul style="list-style-type: none"> <li>• query and response mechanism</li> </ul>
S. calls the Rome Electronic Systems Center. They say yes, the boards are ready to go, but the cognizant engineers have been murdered and they therefore cannot answer the question as to how long it will take to replace the boards and test them. They think that the replacement itself is easy enough, but the required post-installment testing might take some time.	He accesses another ok source, but that source produces only static.  By this time he has made three unsuccessful attempts to reduce uncertainty with respect to timing effects. He gives up this line of questioning.	Need: <ul style="list-style-type: none"> <li>• query and response mechanism</li> </ul>
S. looks at his options again. The third option has a flaw compared with the first two: Risk! If that freighter gets hijacked by the Ferengi, or if it blows up, or if it gets intercepted by Satass Khossim's marauders, then both of the fixes are dead in one fell swoop!	The two single fix solutions are a wash, so he'd naturally look at sending both but discovers a very damaging flaw in that idea: The effect of implementing this option type may be simultaneous loss of all fixes.	Need: <ul style="list-style-type: none"> <li>• options window</li> </ul> Nice to have: <ul style="list-style-type: none"> <li>• means to comment on options in a Remarks section</li> </ul>

<p>S. calls Speedy again and asks her what she can do if she has to transport the hardware and the team separately.</p>	<p>So, if he wants to get both fixes there he must separate them. This is a new option type for which the transportability issue has not been tested yet. He identifies that info need and queries the right source.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• options window to write down new option</li> <li>• means for S. to indicate that he wants to go for the transportability issue on that option</li> <li>• query mechanism</li> </ul>
<p>She says she can get the team there by long-range beaming over three jumps and the hardware could go with the hyperwarp tomorrow. She tells him, though, that three jumps in a row are very hard on people and that these guys might be out for a day when they get there (if they get there all in one piece!). She also tells him that she needs to have his decision in the next 5 minutes; otherwise she would have to commit the freighter capacity to some avionics.</p>	<p>The reply indicates transportation is feasible but there is some risk regarding effects.</p> <p>There is also a stimulus providing mild "time urgency" stress.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• reasonable response mechanism</li> </ul> <p>Nice to have:</p> <ul style="list-style-type: none"> <li>• means to inject stress stimuli</li> </ul>
<p>S. looks at his options again and refines them:</p> <p>Options 1 and 2 get combined into one option: Send both separately: the hardware with the hyperwarp freighter and the people with transporter beam jumps. Option 3 stays the same.</p>	<p>Has actually ruled out the single fix options and has two feasible double fix options.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• options window with editing capability</li> </ul>

<p>S. decides to "diversify his portfolio" and go with the "both, but separate" option.</p>	<p>There is a good deal of effects uncertainty with both options, but he believes that the transporter jumps are not as risky as Haulit makes them out to be, i.e., there is the same uncertainty in both options but less risk in the "both, but separate" one.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• decision selection button</li> </ul>
<p>The usual implementation steps.</p>	<p>Implements the decision by informing all players of what each has to do.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• mechanism for implementing orders and acknowledging responses</li> </ul>

## Cases 4

DM Process in STAR WORLD Scenario	DM Model Interpretation	Student Interface Requirements
S. gets a message indicating that there has been a change to the OPLAN.	Eliciting stimulus.	Need: <ul style="list-style-type: none"> <li>• blinking message announcement</li> <li>• message desk window</li> <li>• to schedule the arrival of the message</li> </ul>
<p>S. accesses the OPLAN change.</p> <p>He learns that the S-15 wings at STARBASE 10 are anticipating tasking for an all-out offensive to free the moon CLAY at a classified time in the near future.</p> <p>In preparation for this offensive, Ogden is tasked to increase the supply on hand of Photon torpedoes at STARBASE 10 by 500 torpedoes forthwith/asap.</p>	<p>Accesses announced information source.</p> <p>Reads, assimilates Situation information.</p> <p>Reads, assimilates Goal information.</p>	Need: <ul style="list-style-type: none"> <li>• means to get to OPLAN either from message desk window or from ORDERS button</li> <li>• display of change to OPLAN</li> <li>• scripting of the OPLAN change</li> </ul>
<p>S. decides he has three basic types of options:</p> <ol style="list-style-type: none"> <li>1. Whole shipment from Earth to Starbase 10.</li> <li>2. Whole shipment from OFF-Earth storage locations to STARBASE 10.</li> <li>3. Split shipment: Move some from Earth and the rest from OFF-Earth locations.</li> </ol>	Since the goal is clearly prescribed, he focuses right away on formulating basic option types.	Need: <ul style="list-style-type: none"> <li>• option window</li> </ul> <p>Nice to have:</p> <ul style="list-style-type: none"> <li>• scratchpad</li> </ul>

S.'s first concern is the issue of availability for all three option types. He knows that the depots have thousands of these torpedoes, but he needs them fast, and if he is taking them from earth storage sites, he needs to get them to Ogden before he can expedite them to STARBASE 10.	Identifies the critical uncertainty type and issue.	Need: <ul style="list-style-type: none"> <li>means for S. to indicate that he wants info for: Uncertainty Type: Feasibility Issue: Availability to clarify option(s): all three</li> </ul>
S. looks in the Worldwide Ammunition Data System (WADS) under Photon Torpedo PT-465 Stockage.	Accesses correct source for availability of required commodity.	Need: <ul style="list-style-type: none"> <li>to provide a WADS lookup table and tag it as a source of availability info</li> </ul>
<p>S. sees the following:</p> <p><u>Earth Storage:</u> Remote Depot 14, 1000 PT-465.Mk6, Date of Manufacture: current year, grade 1a.</p> <p>Ogden SLC, 500 PT-465, Mk.3, Date of Manufacture: five years ago, some surface corrosion.</p> <p><u>OFF-Earth Storage:</u> Numerous locations. All have at least 500 of the specified torpedoes.</p>	<p>Reads, assimilates availability info.</p> <p>Gets too much data to search through.</p>	Need: <ul style="list-style-type: none"> <li>WADS</li> </ul>
<p>S. looks for a location that is closer to SUHDI ABARIA than Earth is and he finds:</p> <p>STARBASE 5, 500 PT-465.Mk5, Date of Manufacture: 3 years ago, no inspection records last 2 years.</p>	<p>Specifies a search criterion.</p> <p>Receives search results.</p>	Need: <ul style="list-style-type: none"> <li>capability to search WADS and display results</li> </ul>

<p>S. now goes to the transportation folks and gives them the following query:</p> <p>500 PT-465 to STARBASE 10</p> <ol style="list-style-type: none"> <li>1. From Remote Depot 14, ETA? (Estimated Time of Arrival)</li> <li>2. From Ogden, ETA?</li> <li>3. From STARBASE 5, ETA?</li> </ol>	<p>Availability for all three option types is now clarified and he turns to the next issue under feasibility: Transportability.</p> <p>Identifies the correct source and formulates a query involving type commodity, number, destination, several origins, and ETA.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means for S. to indicate that he wants to info for: Uncertainty Type: Feasibility Issue: Transportability to clarify option(s): all three</li> <li>• means to formulate a transportation query</li> </ul>
<p>Their response is:</p> <ol style="list-style-type: none"> <li>1. Remote Depot 14 to STARBASE 10, ETA within 6 days, 90% probability.</li> <li>2. Ogden to STARBASE 10, ETA within 4 days, 90% probability.</li> <li>3. STARBASE 5 to STARBASE 10, ETA within 2 days, 80% probability, within 4 days, 95% probability.</li> </ol>	<p>Receives response to query.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to provide information in response to a query</li> </ul>

<p>S. acknowledges their message and ponders his options again.</p> <ul style="list-style-type: none"> <li>• The fastest option is clearly to get the things from STARBASE 5, <u>but</u> it is also the least reliable option. (That is the only reasonable option under option type 2.)</li> <li>• To send the stuff from Ogden is the most reliable option, <u>but</u> the torpedoes are a bit old and rickety. (This is one option under type 1.)</li> <li>• The stuff from Remote Depot 14 is first-class merchandise, <u>but</u> it takes the longest (this is the other option under type 1).</li> </ul>	<p>Edits/reviews options.</p> <p>The set of Options under Type 1 and Type 2 is a classical dilemma: No matter what he decides there are always some drawbacks.</p> <p>Dilemmas can only be solved by setting or changing goals/priorities or by finding new options through combining old options such that drawbacks of one are offset by advantages in the other.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• option window</li> </ul> <p>Nice to have:</p> <ul style="list-style-type: none"> <li>• scratchpad</li> <li>• response acknowledgement feature</li> </ul>
<p>S. formulates a specific option for option type #3:</p> <ul style="list-style-type: none"> <li>• Send 250 from STARBASE 5 and send 250 from Ogden <b>and</b>, in anticipation of more orders, move the entire stock at RD14 to Ogden posthaste or muy pronto.</li> </ul> <p>This combines "fast" with "reliable" and it gets the "high quality" stuff ready for action.</p>	<p>Edits options.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• option window</li> </ul>
<p>S. decides to go with the split option defined above.</p>	<p>Decision Point.</p>	<p>Need:</p> <ul style="list-style-type: none"> <li>• means to select an option as the decision</li> </ul>

S. takes the usual implementation steps involving messages to all sources, to transportation, and to the recipients.	Implementation steps.	Need: <ul style="list-style-type: none"> <li>• feature for writing, sending, and acknowledgement of implementation orders</li> </ul>
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